the OIL AND GAS JOURNAL
PUBLISHED WEEKLY DECEMBER 5, 1960

ELECTRICALLY BALANCED WELLS

Boost Production

p. 96

NEWS

New wage pattern not defined yet ▸ 71

Automation: New inventory tool ▸ 74

AAPG seeks cure for geology's ills ▸ 80

TECHNOLOGY

Does casing promote corrosion at crossings? ▸ 103

Centrifugal mud pumps save on Gulf Coast ▸ 106

One of three International T-340 crawlers used by a prominent Midwest utility company for laying distribution lines. The T-340 shown laid 6,000 feet of six-inch main, replacing a 67-year-old four-inch line on this particular job.

Save the expense of an additional tractor by using the T-340 boom tractor for backfilling. Six-foot blade is hydraulically controlled. It can be angled manually 25 degrees right or left for bedding down the pipe safely.

Husky, low-cost 47-hp* crawler...

handles line pipe up to 6 inches

Now you can have crawler tractor pipe-handling at a cost-cutting price for the multitude of jobs requiring 6,500-lb sideboom capacity or less. International T-340 is priced thousands of dollars less than the next larger size sideboom crawler.

With 66-inch track length ground contact, the T-340 has excellent flotation in soft footing with 10, 12 or 14-inch shoes as conditions require. Bolt-on rubber shoes permit work on city streets without damage to pavement. Compact size of tractor makes job-to-job moves by small trailer fast and easy.

On jobs where you now use larger or less efficient power, you'll often find that a husky, hustling T-340 or TD-340 will cut costs to the bone. Ask your nearby IH dealer for complete specifications, or write International Harvester Co., Dept. 06J-12, P.O. Box 7333, Chicago 80, Illinois.

**Maximum engine hp corrected to standard conditions*

Twelve-foot boom gives the T-340 "boardinghouse" reach so that the tractor can remain on firm footing in rugged terrain. Constant load-control prevents accidental dropping.

INTERNATIONAL HARVESTER

OIL AND GAS JOURNAL
Vol. 58, No. 49

Contents December 5, 1960

THE WEEK'S NEWS

General Interest:

New Wage Pattern Is Still to Be Set ... 71
Automation Helps Atlantic Keep an Eye on Inventories ... 74
FPC Won't Hear Phillips Case Again, Court Test May Be Next ... 79
Tennessee Gas Plans Corporate Reorganization ... 81
Interior Going Ahead With Oil Imports Reduction ... 82
Transco Sets Maximum Rate for New LPG Line ... 84
Payment Frees LPG Patent for Public Use ... 89
Socony Hopes Big Computer Will Find Ways to Cut Costs ... 90

Processing:

California Standard Runs Cat Cracker by Remote Control ... 73
Texas Butadiene Will Meet Competition With Foreign Investment ... 78
Processing Briefs ... 83

Drilling-Production:

Offshore California Gas Discovery Confirmed ... 72
Citronelle Development Program Is Under Way ... 72
Proration Ordered in Texas' Big East Panhandle Field ... 76
Railroad Commission Turns Down East Texas Field Economy Plan ... 77
Drilling in 1961 Will Stick Close to Present Level ... 83

Foreign News:

Shell Wins Rich Offshore Prize From Kuwait ... 91
Jersey Firm May Sell Shares to Indian Public ... 92
Japan's First Delayed Coker Goes on Stream ... 94
Thai Government Approves Refinery ... 94
Middle East Paces World Production to All-Time High ... 95

Exploration:

What's Wrong With Geology? AAPG Committee Intends to Find Out ... 80
Wildcat Spudded in Alaskan Tidelands ... 89
Mecom Ready to Aim at Drilling Record ... 90
Washington's Still an Oil State—But Just Barely ... 155
Lisbon Qualifies as One of Year's Major Rocky Mountain Finds ... 156
Unusual Equipment Moves Oil Crew Over Louisiana Swamps ... 160
Exploration Outlook: Offshore Texas Activity Picks Up ... 163
Pennsylvania Shallow-Well Completions ... 165

REGULAR FEATURES

Advertisers' Index ... 187
Calendar of Events ... 63
Classified Advertising ... 184
Deaths ... 176
Drilling Contractors ... 158
Drilling Statistics ... 179
Editorial ... 73
Equipment Men ... 152
Exploration Highlights 161
Foreign News ... 91
Journally Speaking ... 71
Markets ... 182
New Equipment ... 141
Personals ... 174
Process Costimating ... 119
Production ... 180
Refining Statistics ... 181
Selected Monthly Data 183
Statistical Summary ... 178
The Journal Said ... 71
They Say ... 60
Trade Literature ... 149
Watching Washington 86
Who's Who in Oil ... 174

Technology-Operation section on next page →

The Oil and Gas Journal is published weekly by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 3, Okla. Second-Class postage paid at Tulsa, Okla. Copyright 1960 by The Petroleum Publishing Co. United States and foreign rates to the petroleum industry, 1 year $5, 2 years $8, 3 years $10.

TECHNOLOGY—OPERATION

Drilling-Production

Electrically Balanced Wells Relieve Production Problems 96

By V. C. Crites and M. K. Fjeldsted

Tests on wells with acute production problems show that in all cases the wells were benefited by being electrically balanced. Even though old problem wells can be benefited, electrically balancing of new wells should pay off even more, enabling them to produce at a high rate for a longer period of time at less cost.

Centrifugal Mud Pumps Save Money for Gulf Coast Drillers 106

By Foster Manning

They can be used to operate the mud hoppers, agitate tanks, supercharge pumps, and operate other equipment such as degassers and desanders. The centrifugals are not only cheaper to buy, they are also cheaper and more flexible in operation.

Oil-Well Pumping—25 114

By Joseph Zaba

Why correct plunger size is important.

New Tubing Joint Has Advantages for Drillers 128

By Ed McGhee

This new collar-type joint for nonupset tubing has almost all the advantages of upset-tubing joints. It combines low cost, leak tightness, and small diameter.

Pipelining

Casing Promotes Corrosion at Crossings 103

By Robert J. Kuhn

Casing does not enhance the safety of pipeline crossings since it permits, even promotes, corrosion of the carrier pipe by preventing its cathodic protection. It would make better sense to use the money spent for the casing to install a well-coated carrier pipe, made of either higher-strength steel or heavier-wall pipe.

Why Engine Lubrication Fails 132

By O. H. Moore

This installment, Part 1 of a three-part series, blames poor lubrication on faulty equipment. Irregular patterns of wear are results of erratic oil delivery.

Refining-Processing

Questions on Technology 109

Where to find enthalpy charts of petroleum fractions—References on desalting crude oil—References on manufacture of hydrazine.

Finding Troubles in Process Instruments 110

By Clarence R. Skalnik

An instrument will work well in one plant and fail miserably in another. Failures are primarily results of some unfriendly factor in the instrument's environment. Here are case histories of some typical problems which show ways of identifying unfriendly factors and then neutralizing them.

Refinery Cost Indexes 113

Petrochemicals Continue Lead in Plant Construction 119

By Robert B. Bizal

New refining and field-processing projects in U. S. and Canada dwarfed by number of new petrochemical installations. Refinery rundown includes first Lomax and Isocracking units. Giant new Kansas plant highlights field-processing activity.

The Foreman's Page 127

Quiz on refinery chemistry.

The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Dec. 5, 1960

New trends in use of computers are developing fast:

Experience has given oil scientists the know-how and in addition they have had a chance to test the hardware available to them.

That was very evident at the WPRA computer conference held in Tulsa last week.

Experience has taught oil management to:

...Put more emphasis on the people who run computers, set the problems, plan the programs than on mere equipment.

...Take a hard look at justifying the equipment rather than buying it just to impress financial analysts.

Main justification for installing computers is to cut the overhead—usually the white-collar payroll—according to Atlantic Refining's R. D. Bent.

Number of white-collar workers in U. S. exceeded the blue-collar ranks for the first time in 1956, an indication that American overhead costs are getting top heavy.

Bent says when computers are put to work on real problems they can decrease this overhead.

Oil management also has found that expensive, permanent on-line computer control may not pay out.

Great efficiency is realized when process controls are first installed. After that, the incremental increase in efficiency doesn't justify computer control.

A new approach: Install proper instruments and make an exhaustive study on a general-purpose machine. Permanent improvements thus effected can be retained when the machine is switched to other work.

▼ ▼ ▼

Current offers of 5% wage increase (p. 71)* appear far from being accepted as pattern for industry. Plenty of talking is yet to be done before agreements emerge.

Unions aren't buying the 5% raise tied to a 2-year contract. And many of the companies aren't yet ready to make

---

*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

any kind of firm offer.

Petroleum geologists are trying to streamline their profession to meet changing needs of the oil industry.

A special AAPG committee hopes to slow up the unemployment trend, prevent possible shortages of earth scientists in years to come, and swing teaching programs more in line with company needs (p. 80).

Correction: It was Sohio Petroleum, not Ohio Oil as reported last week, that has released a number of geologists because it was overstaffed for present slowed-up activity.

▼ ▼ ▼

Result of the long negotiations between the Iraqi Government and Iraq Petroleum Co. may soon be revealed.

Abdul Karim Kassim, the Iraqi revolutionary prime minister, has told the oil workers trade union in Baghdad we would announce in a few days "what we have gained and what we will gain in the future."

The prolonged talks have been secret at the insistence of Kassim. But the Iraqis are known to be insisting that the company relinquish a large part of its concession in Iraq among other things.

Venezuelan troops are guarding oil installations in Lake Maracaibo and eastern Venezuelan areas.

Move to protect country's vital oil facilities followed riots in Caracas which the government said have been fomented by communists and Fidel Castro supporters trying to set up a Cuban-type regime.

▼ ▼ ▼

Use of turbine meters may prove attractive in interface detection for products pipelines.

Here's how they work: Effect of viscosity change on rotation speed will indicate arrival of an interface between two different products pumped at a uniform rate.

Simplicity of the turbine is one of its advantages.

American banks are financing 8-in. products line and 12-in. natural-gas line in Mexico from Torreon to Chihuahua.

Pemex has obtained 5-year loans totaling $16 million from Bank of America, Chase Manhattan, Chemical Bank of New York, and Continental Illinois National. Construction is getting started on the dual lines.

Pemex may have a market for nearly 5,000 bbl. daily of its heavy Panuco crude at the Brownsville, Tex., asphalt plant of Western Natural Gas. The American firm would like to get an import quota for the crude which is 12°-gravity with a gasoline yield of only 4 to 5%, ideal for making asphalt.

Pipeliners will be interested in this experience of a major system: Lower cost of new type installation for reciprocating compressors enables them to be competitive in costs with 2-shaft standard gas turbines where the units are added at a station.

▼ ▼ ▼

California natural-gas producers now may sell direct to an industrial customer without coming under control of the state's Public Utilities Commission.

That's the ruling of the U. S. Supreme Court in upholding a similar decision by the California courts.

Case arose when Southern Counties Gas Co. challenged Richfield's right to sell gas to an electric power company. The decision now may lead other producers to sell direct to big customers rather than to the gas utilities.

Proration has been ordered for huge East Panhandle gas field by the Texas Railroad Commission effective January 1.

Idea of the order: To minimize current widespread drainage and nonratable take not only between leases within the field but also between East and West Panhandle fields.

Basis of new allowables will be two-thirds on acreage and one-third on potential of the well. The order climaxes a bitter but significant fight by producers in the area (p. 76).

▼ ▼ ▼

Humble's Enco brand is being put to a real test in California where the company has opened 35 new stations, all purchased from other marketers.

It's seen as further evidence that Humble may pick Enco as its brand for ultimate nationwide use.

Industry notes: Domestic wildcat completions are now trailing last year's activity by 4%—8,723 completions to 9,072...But Nebraska operators have filed 902 notices of intention to drill so far this year, a new record...Murphy Corp. has abandoned the east offset to its Tule Creek Devonian discovery in Roosevelt County, Montana, and is moving the rig to a new location north of the discovery...Shell plans to use a factual, hard-sell approach in its 1961 gasoline and oil advertising campaign. Newspapers will get most of the budget... Mobil has found that college seniors who get a special credit card are better pay than their parents...Alaska's oil search has moved offshore with California Standard whipstocking well under Cook Inlet from Kenai onshore site (p. 89)...Atlantic Refining is keeping a fast, accurate control on its materials inventories over the country with a new punched-card system that is proving a cost saver (p. 74).

Market Memo

Dec. 5, 1960

Military fuel purchasing may undergo major changes.

Reason: Presidential directive to Defense Department to buy supplies in U. S. for overseas use to help stem outflow of gold reserves.

This is the possible impact on domestic oil industry:

Oil purchases in U. S. would increase, but total military buying might drop because of higher costs.

U. S. Coastal refineries may be urged to change their run patterns to meet military requirements for higher output of jet fuels and Navy special.

Tanker chartering would increase because of longer hauls involved in getting U. S. products to overseas installations.

Picture will become clearer soon. Defense Department's division of oil logistics has December 15 target for report on what the military can do to help meet presidential order.

Watch for start of monthly report by OCDM of East Coast residual fuel-oil price averages.

This is part of price surveillance program undertaken by agency. Figures initially will be based on monthly reports on sales made to agency by residual fuel-oil suppliers.

Cold weather may have arrived just in time to help middle distillates. It's too late for big volume gasoline demand. API statistics show the situation: Refinery runs averaged 8,092,000 bbl. daily last week, up from 7,987,000 bbl. the week before. Four-product stocks rose 4,670,000 bbl. for the week compared to 2,147,000 bbl. drop in 1959.

The market roundup:

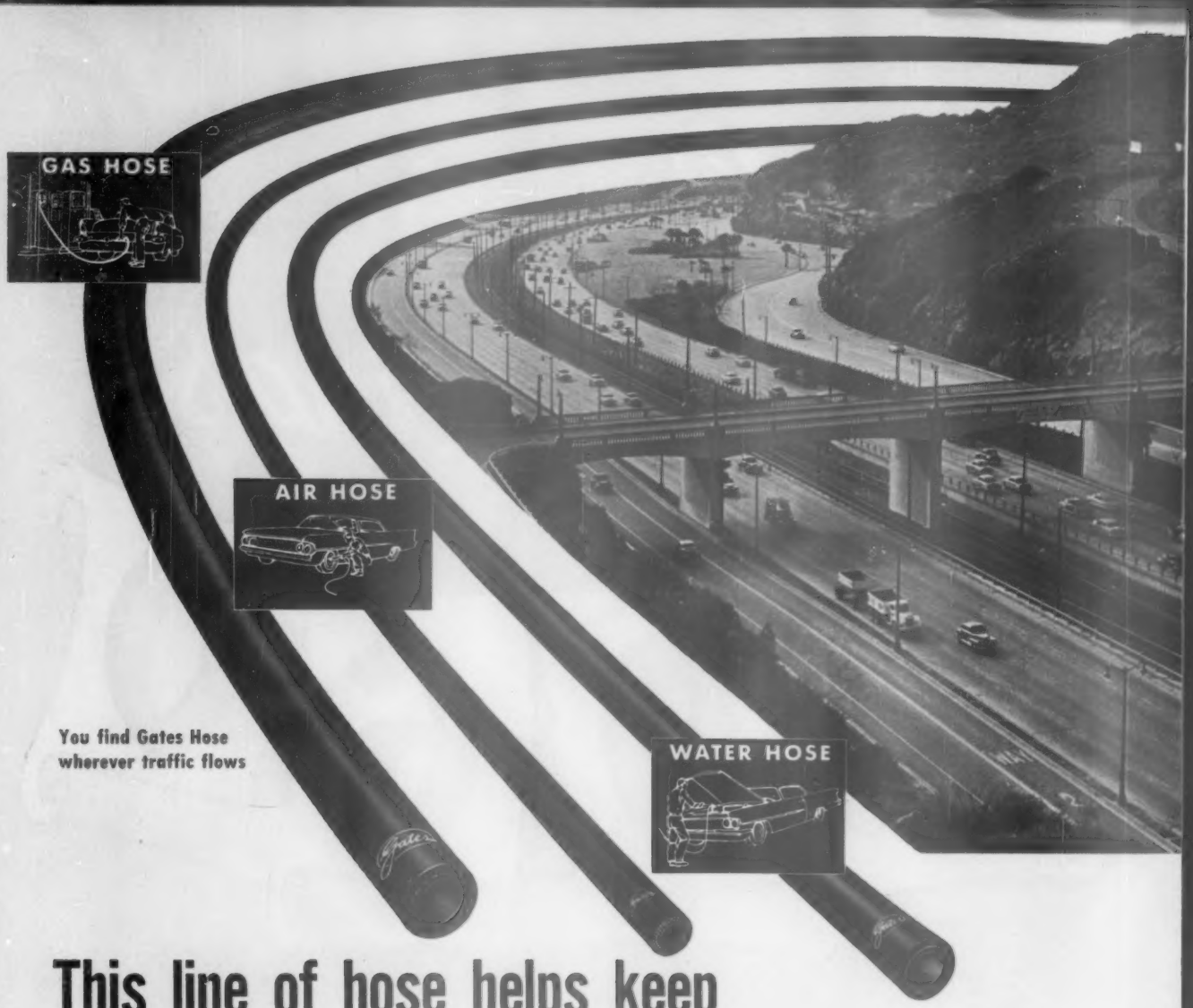
Gulf Coast—Sales are lacking to confirm posted prices. Five cargoes of 92-RON gasoline held by independents and available for sale give 11.25-cent posting a tired look. No. 2 at 8.25 cents per gallon is still holding without discount.

Midwest—Colder weather has put middle distillates on firmer price basis. Discounts from postings of 10 cents on No. 1 and 9 cents on No. 2 are out of the picture. Gasoline out of Great Lakes pipeline is posted at 12.5 cents for 91-RON with discounts of one-quarter to one-half cent on spots.

Chicago—Product prices are being discounted by one-quarter cent. Weather should take slack out of burning oils now posted at 10.25 cents for No. 1 and 9.5 for No. 2. Gasoline is holding at 12.625 cents in spite of discounts.

River—Markets quiet. Refiners are not offering bargain discounts on burning oils. There's little interest in gasoline at 10.75 to 11.25 cents.

Season's Greetings
1960
Our Pledge
Many thanks for your past favors,
Sent with wishes most sincere
And Our Pledge of faithful service,
Throughout all the coming year
THE
Bovaird
SUPPLY COMPANY



This line of hose helps keep 70,000,000 vehicles on the move

To service some 70 million motor vehicles with gas, air, water and grease, this nation's 183,000 service stations use uncounted miles of hose. Because Gates is a major manufacturer of industrial hose, thousands and thousands of these stations rely upon Gates Curb Pump Hose, High Pressure Grease Hose, Air, Water and Low Pressure Steam Hose.

In back of this broad acceptance of Gates Hose is a continuing program of specialized hose research at the multi-million dollar Gates Research Center. The aim of this *specialized research* is to increase hose utility, lengthen hose life and lower industry's annual hose costs.

Because Gates Hose is so widely preferred, it is quickly available from leading distributors in all industrial centers. These Gates Hose Distributors are listed in the phone book Yellow Pages.

TPA502

The Gates Rubber Company

The Mark of *Specialized* Research

Gates Industrial Hose / Made in a Full Range of Types and Sizes

Watch United States Steel's special Christmas show, **The Coming of Christ**, in Color on NBC-TV, Wednesday, December 21, 8:30 P.M., E.S.T.

"Oilwell's" new super-hardened NITRILINE pump barrel is already running up records!

This new, alloy steel pump barrel (bore hardened by our own exclusive and patented Nitrocycle process) is built to last . . . and last . . . and last. It is hard on the inside, tough on the outside . . . and has a close, .001", tolerance. Although the NITRILINE is designed primarily to resist abrasive wear, with a uniform hardness layer end-to-end, it also resists mild corrosion and hydrogen embrittlement.

What operators are saying after testing in their "problem" wells—

Independent Operator, Eastern Illinois: ". . . well had ruined three other barrels in 90 days. The NITRILINE barrel ran 102 days before pulling."

Major Oil Co. Superintendent, West Texas: "We pulled the pump with test NITRILINE barrel after a 60-day run. It looked good. I remember when a 30-day run in this well was considered better than average."

Superintendent for Independent Producer, Rocky Mountains: "Even the 'Oilwell' man was surprised at the 6-month NITRILINE run. We used to replace barrels in that well almost every month."

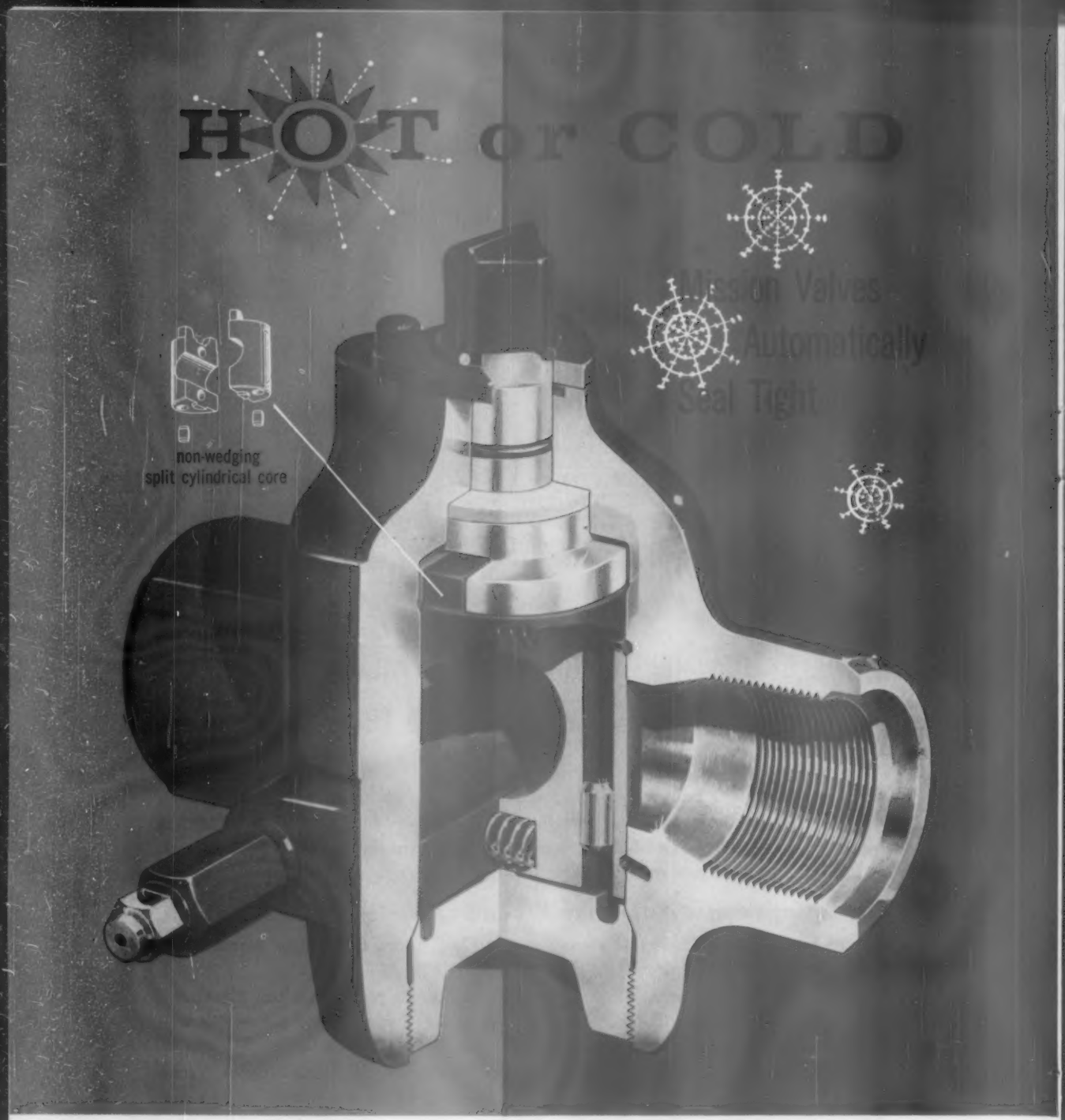
"Oilwell's" NITRILINE barrel could be just the answer to your problems. Why not pick your most abrasive well and run your own test with this modern barrel? It is priced no higher than other so-called "hard" steel barrels, but should outperform any one of them!

You can get more information about these new NITRILINE pump barrels from the nearest "Oilwell" store or representative.

USS, "Oilwell" and NITRILINE are registered trademarks

USS **Oil Well Supply Division of United States Steel**

Executive Offices: Dallas, Texas
Export Offices: 30 Rockefeller Plaza, New York 20, N. Y.



No Thermal Distortion. Here's why: A non-wedging, split cylindrical core seals without wedging. Only the downstream core half is pressed against the body by line pressure. It literally "floats" into position to compensate for thermal or physical distortion. The upstream core half is held lightly against the body only by spring pressure. The circular sealant groove is positioned at the heaviest section in the valve body thereby eliminating distortion and effecting a perfect seal in this critical area. Sealant is forced automatically — by line pressure itself — through two semi-circular grooves around the downstream port. Leaks are literally stopped before they begin.

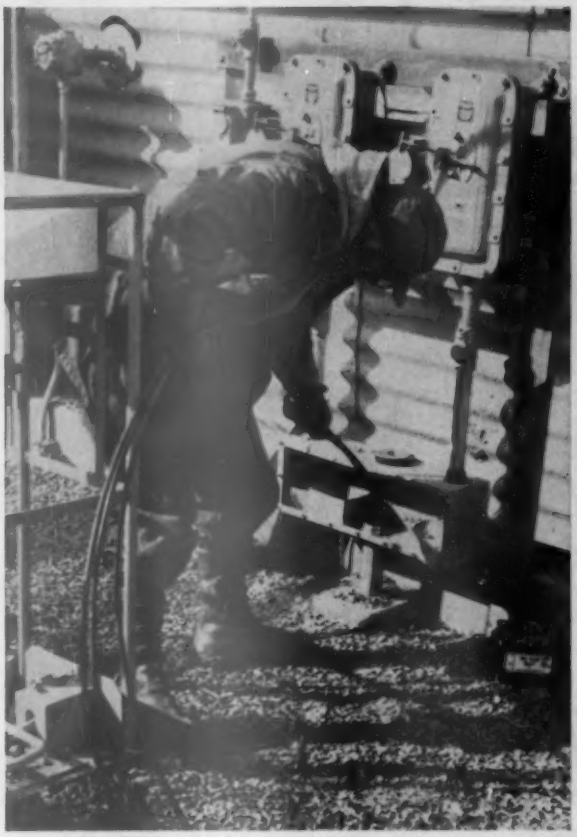
Mission features a full hole, round opening valve with no restrictions, no turbulence. Regular round opening valves are also available. The wide selection of more than 315 valves to choose from, the Mission guarantee, and the Mission Valve Renewal Policy combine to make Mission your best and most economical buy.

MISSION MANUFACTURING CO. P. O. BOX 4209, HOUSTON, TEXAS CABLE ADDRESS "MISSCO"
EXPORT OFFICE: 30 ROCKEFELLER PLAZA, NEW YORK • In the United Kingdom: **MISSION MANUFACTURING CO., LTD.,**
1 Hanover Square, London W. 1 England • cable address "MISSOMAN"

MISSION MANUFACTURING CO.

Another new development using

B.F.Goodrich Chemical *raw materials*



New THW wire insulated with Geon is used in sizes up to 3/0 AWG at this new Sohio plant. Wire is made by the Paranite Wire and Cable Division of the Essex Wire Corporation, Marion, Indiana. B.F.Goodrich Chemical Company supplies the Geon vinyl.

"We welcome the higher factor of safety"

. . . of new THW wire insulated with GEON vinyl

These pictures show new wiring going into the Sohio Chemical plant at Lima, Ohio. Here's what the contractor, W. W. Clark Corporation of Cleveland has to say about it:

"In a chemical plant or refinery, electrical wiring often has to go near processing equipment that operates at high temperatures. We try to keep it at least a foot away, but sometimes have to go as close as 6". We welcome the higher factor of safety this new THW wire gives us."

Now you can add new heat resistance to the proved properties of insulation of Geon vinyl. Geon is tough, weatherproof and keeps its exceptional properties with age. It also resists oils, greases and chemicals.

For information about Geon wire and cable covering, or other ways that Geon improves products or opens new markets, write Dept. GR-6, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Geon VINYLS

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

Heralding

'Hunt' a Better Deal in Oil Banking!

Not even this business crest can show all the facets of Executive Vice President Russell F. Hunt's career. From law to oil and industry; from Cumberland U. to the Tulsa Chamber of Commerce; from busy colonel to banking and currency; his is a background rich in both public and private affairs. And thanks to his personal experience in the industry, Russell Hunt knows oil men's problems! If you're hunting for the best in oil banking, from one of the most able and experienced oil departments in America (with one of the nation's largest oil-credit files), just . . .

Think... 1st of Tulsa SINCE 1895

FIRST NATIONAL BANK AND TRUST COMPANY

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

More work out of trucks ...at Lower Cost?

EATON 2-SPEED AXLES WILL DO IT!

On-the-job performance records prove that trucks equipped with Eaton 2-Speed Axles make quicker trips, travel more miles at lower cost per mile. By providing *double* the conventional number of gear ratios—the right gear ratio for every road and load—they reduce stress and wear on engine and power transmitting parts; permit engines to run efficiently under all operating conditions.

Eaton's exclusive features, including forced-flow lubrication, planetary gearing, and Inductalloy Axle Shafts, add thousands of miles to axle life, and eliminate costly maintenance expense worries.

Ask your dealer to explain how Eaton 2-Speed Axles reduce hauling costs, add to profits, and make trucks worth more on the trade-in.

EATON
2-SPEED
AXLES

More than 2 Million Eaton Axles in Trucks Today

EATON

AXLE DIVISION
MANUFACTURING COMPANY
CLEVELAND 10, OHIO

You get parts interchangability with the BS&B "Universal" Controller

★ ON AND OFF ★ PROPORTIONAL

★ PROPORTIONAL PLUS RATE

★ PROPORTIONAL PLUS RESET

★ PROPORTIONAL PLUS RATE AND RESET

One Basic Controller Provides 5 Modes of Control

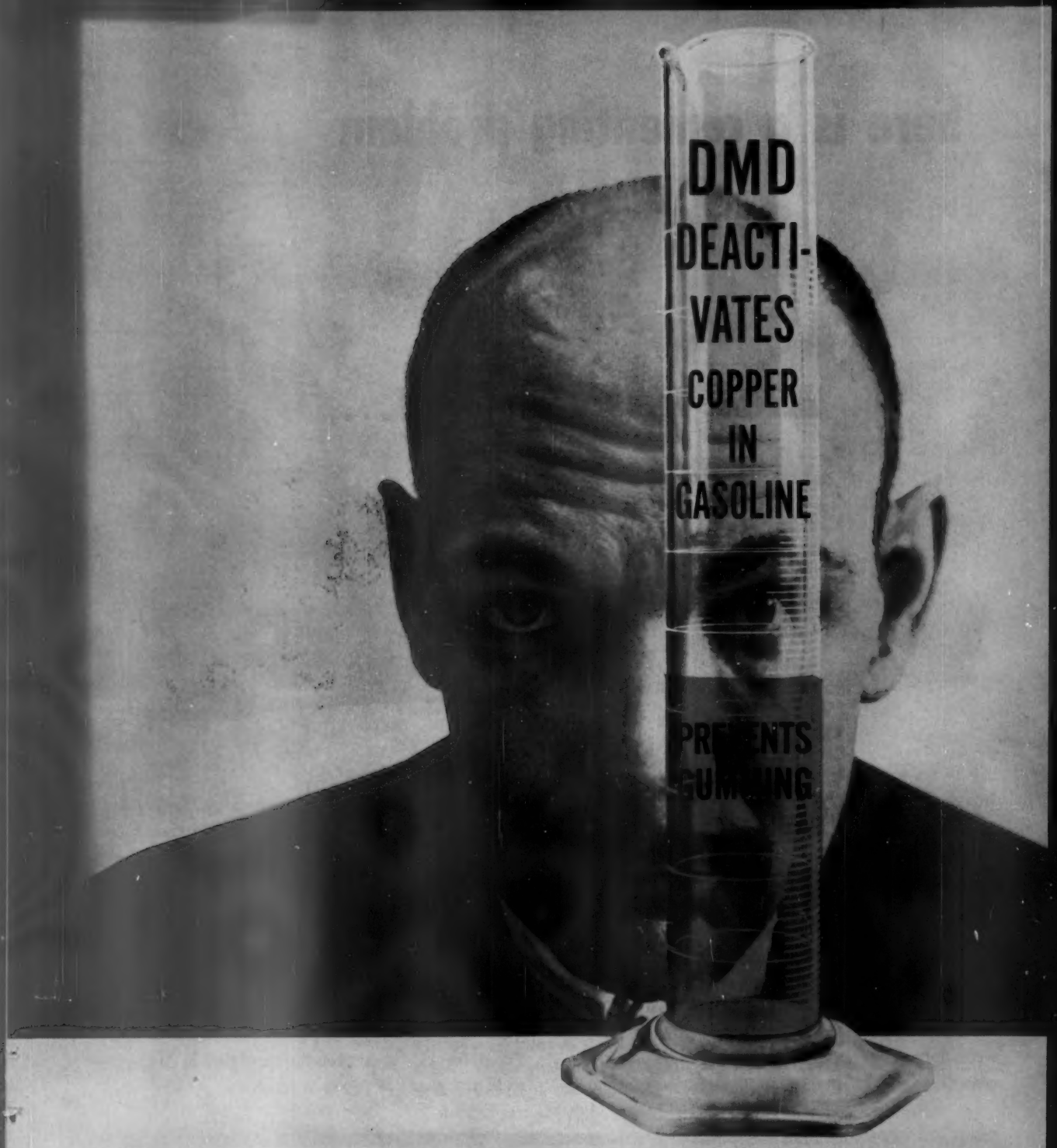
What does this mean to you? With common parts, inventory can be reduced. Delays and shut-downs are held at a minimum. Moreover, the design simplicity which makes the BS&B Pneumatic Controller "Universal" provides years of trouble free operation.

Let our sales engineer show you the many advantages of using BS&B Controlled Systems or write: BLACK, SIVALLS & BRYSON, INC., Dept. 4-A12, 301 N. Cincinnati, Tulsa, Oklahoma.

BS&B

BLACK, SIVALLS & BRYSON

TULSA • EDMONTON • LONDON • PARIS • THE HAGUE



HERE IS ENOUGH (3 ounces) Du Pont Metal Deactivator to prevent copper-caused gumming in 8000 gallons of gasoline. ■ Somewhere, somehow, nearly every gallon of the gasoline, kerosine, jet or diesel fuel you produce will come in contact with at least a tiny bit of copper. Can't be helped. ■ By adding DMD to the fuel, you convert any dissolved copper into harmless chelate complexes. Result? No gum, no loss of product quality, no complaints. ■ This additive, which Du Pont pioneered 20 years ago, is still the best metal deactivator known to petroleum science. And as you can see, a little goes a long way. Figure the economics for yourself, or ask us to. ■ E. I. du Pont de Nemours & Co. (Inc.), Petroleum Chemicals Division, Wilmington 98, Delaware.

DU PONT

DU PONT TETRAETHYL LEAD and OTHER PETROLEUM ADDITIVES

Better Things for Better Living . . . *through Chemistry*

here is a cementing problem

SOLVED

BEFORE IT COULD HAPPEN...

Imagine this well is yours. You're skeptical because of this formation's history... drilling returns, core samples – everything points to probable trouble... severe lost circulation during cementing. That's your problem – and here's how you handle it:

FIRST call in your Halliburton man to help select the best combination of materials and equipment you will need for the job.

The Halliburton man explains how GILSONITE is designed to lighten slurry density to help protect those weak formations from the hydrostatic head of the cement... *and* he points out the excellent bridging characteristics of GILSONITE which will help control any breakthrough that might occur. You then select GILSONITE to help control the circulation losses you expect.

NEXT you pick the right equipment – Halliburton Bulk Handling Equipment to provide up to 1,250 cu. ft. of cement from each unit – at speeds up to 40 sacks per minute without bothersome sack handling, spillage, or breakage. For smooth, dependable placement of the slurry, you choose Halliburton HT-400 Pump Trucks – giving you the capability to do the job *well*, and plenty of power in reserve.

SO YOU'VE SOLVED TODAY'S PROBLEM

but what about tomorrow... and the day after that... here's the answer...

DEPEND ON HALLIBURTON SPECIAL CEMENTS AND ADDITIVES IN ANY APPLICATION INTENDED FOR THEIR USE

for instance . . .

LATEX CEMENT – excellent for use in cementing through permeable zones. The low fluid loss qualities of Latex Cement help limit the amount of cement filterate entering into the producing strata.

POZMIX CEMENT – to provide maximum protection against corrosion, contamination and poor bonding between pipe and formation. For average depths and temperatures, Pozmix "A" and "S" provide superior qualities such as light weight slurries, low permeability and improved pumpability. Deeper, hotter wells call for Pozmix 140 which gives strength stability in well temperatures up to 400° F.

GILSONITE CEMENT – provides a low density slurry with excellent lost circulation control characteristics. This natural hydrocarbon has a specific gravity of 1.07 and when added to a cement slurry neither retards nor accelerates the setting time.

RADIOACTIVE CEMENT – provides you with the important ability to survey the condition of the job after completion. Accurate measure of the top of cement, location and disposition of squeeze cement, general condition of cement around specific zones, and other valuable knowledge.

RESIN-CEMENT – is widely used to help control production of unwanted water or gas. A mixture of resins, water and portland cement, this product helps seal off troublesome formation intervals by forming an impermeable bond in the zone adjacent to the plug in the well bore.

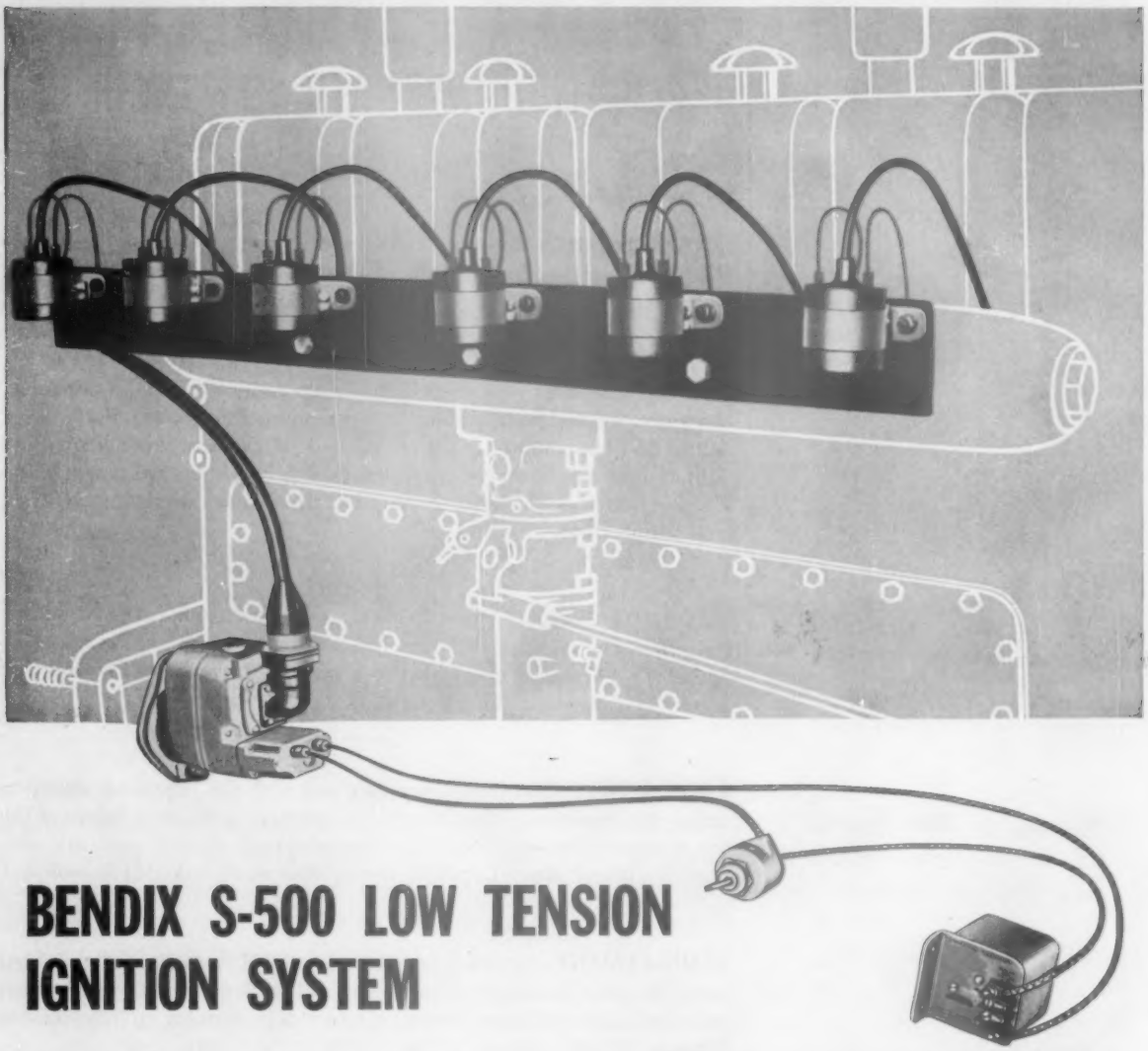
The dependability of these Halliburton products is matched by the experienced performance of the Halliburton specialists who help you use them. Ask your Halliburton Representative to recommend the *best* combination of men, materials and equipment to handle your next cementing job.

275 Service Centers – just minutes away from your well

CEMENTING SERVICES

Halliburton
COMPANY • DUNCAN, OKLAHOMA

The latest for small-to-medium industrial engines



BENDIX S-500 LOW TENSION IGNITION SYSTEM

The S-500 System provides the ultimate in starting and operating efficiency for your four, six, and eight cylinder industrial engines. Specify the new Bendix[T.M.] S-500 Low Tension Ignition System. It features "the modern starting concept"—retard breaker magneto and starting vibrator system.

This complete Low Tension Ignition System—including transformer coils, wiring cable assembly, starting vibrator, ignition and starting control switch, and retard breaker magneto—is custom-engineered to assure positive ignition at all cranking speeds and varied retard requirements. It is furnished in base or flange mounting, flameproof and radio shielded, is adaptable for manual or automatically controlled installations.

TRADEMARK

The S-500 Series, either base or flange mounted, is supplied with the following features:

S-500 Standard Shielding, adjustable drive assembly.
S-501 Standard Shielding, adjustable impulse coupling.
S-502 Super-shielded, adjustable drive assembly.
S-503 Super-shielded, adjustable impulse coupling.
S-504 Standard Shielding, retard breaker, adjustable drive.
S-505 Super-shielded, retard breaker, adjustable drive.

For additional information concerning the best Bendix Ignition System for your particular engine requirements, write:

Scintilla Division
SIDNEY, NEW YORK

THE Bendix CORPORATION

Export Sales & Service: Bendix International, 205 E. 42nd St., New York 17, N. Y.

NEW BAROID RHEOMETER TESTS FLOW PROPERTIES

The new BAROID RHEOMETER is a rotational viscometer to field-test the flow properties of drilling fluids. The BAROID RHEOMETER operates at two rotational shear rates. Readings are used to determine the *plastic viscosity* and *yield point* of drilling fluids.

USES NO ELECTRICAL POWER

The precision-built BAROID RHEOMETER operates by turning a small crank. This drives the rotor at a pre-selected constant speed of either 300 or 600 rpm. It can be operated at a higher speed to stir samples. Gel strengths can be determined with direct readings from a deflection scale. Write for complete information and price.

BAROID

BAROID DIVISION National Lead Company, P. O. Box 1675, Houston 1, Texas

Licensed by the courtesy of Socony Mobil Oil Co., Inc. under its Patent Number 2,703,008.

6005

A reindeer brings you Season's Greetings
when you write to
SANTA CLAUS
(specialist in world peace)

A Field Engineer brings you profitable ideas when you write to *LINCOLN*

(specialists in arc welding)

WRITING to Santa Claus is an exciting experience for the whole family. Eager faces . . . pencilled lists . . . crackling fire . . . and the air alive with expectancy. And then the long, almost unending wait until Christmas, when miraculously St. Nick generally delivers even a little more than was desired. This is why we have faith in him. That's the spirit of Christmas!

Now, we don't say our Field Engineers will arrive in sleighs filled with toys, but this we can guarantee: if you write a letter to LINCOLN, the Field Engineer who calls will be able to give you a good deal more help than you expected. Not only does he know welding products but also the best procedure to use on each job. He understands how to relate welding profitably to your total operation.

That's why so many companies who have had faith in LINCOLN for over fifty years say, "It's a good idea to do business with LINCOLN where arc welding is a specialty and cost reduction comes to you as a 'plus' at no charge."

Merry Christmas!

THE LINCOLN ELECTRIC COMPANY
Dept. 2560 • Cleveland 17, Ohio

LINCOLN WELDERS

Engineering Progress Report

FROM UNION CARBIDE CHEMICALS COMPANY

Glycol Dehydrators give 90°F. Dew Point Depressions...

Improved regeneration systems give high glycol concentrations

There are two methods commonly used today to dehydrate natural gas: one employs glycols; the other, dry desiccants. Most authorities agree that glycol systems are less expensive in both initial and operating costs. Recent engineering advances now permit dew point depressions up to 90°F. with economical glycol-type dehydrators. Union Carbide Chemicals Company maintains an extensive engineering service group designed to help the natural gas industry obtain the best possible dehydration service with CARBIDE's diethylene glycol and triethylene glycol.

A GRADUAL IMPROVEMENT

Diethylene glycol was first used to dehydrate natural gas in 1936 and by 1939 sixteen glycol type plants were in service providing average dew point depressions in the range of 40°F. Triethylene glycol was first used to dehydrate natural gas in 1949. The dew point depressions realized with glycol type plants have gradually increased until today the standard guarantee is a 65°F. depression or gas containing seven pounds of water per MMSCF, whichever first occurs. For sometime now, some equipment manufacturers have offered a 75°F. dew point depression guarantee.

FACTORS INFLUENCING DEW POINT DEPRESSION

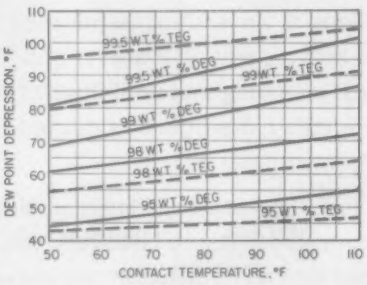
The dew-point depression obtained with a glycol dehydration plant depends upon several factors, such as:

1. Concentration of water in the lean glycol solution.
2. Glycol circulation rate.
3. Contact temperature in the top of the absorber column.
4. Efficiency of gas to glycol contact in the absorber.

Even with conservative design and operation, however, the dew point of the gas leaving the glycol contactor cannot be lower than the equilibrium value for the conditions of temperature and glycol concentration found on the top plate.

HIGH GLYCOL CONCENTRATIONS

The high diethylene and triethylene glycol concentrations now being obtained in plant practice, prompted studies to determine the dew point depressions obtainable with such solutions.



These data indicate that both diethylene and triethylene glycol at 99.5 per cent concentrations provide dew-point depressions in the 80°-105°F. range.

At concentrations of 98 per cent and lower, diethylene glycol provides better depressions than equal concentrations of triethylene glycol, while at 99 and 99.5 per cent concentrations, triethylene glycol appears to allow a 5°-10°F. lower dew point than diethylene glycol.

90°F. DEPRESSION MEETS TRANSMISSION REQUIREMENTS

Glycol regeneration equipment on the market today is capable of producing and maintaining glycol concentrations above 99%. Thus, it is possible for equipment manufacturers to guarantee a 90°F. minimum dew point depression. There are very few instances where a 90°F. depression will not meet the water content specifications of any long distance gas transmission company.

CARBIDE'S RESEARCH PROGRAM

Dew point depression studies are but one phase of CARBIDE's extensive research activities designed to improve the products and processes of the natural gas treating industry. CARBIDE's Technical Service Department stands ready to help you obtain the best possible results from your gas treating installations. For more information on the use of CARBIDE's glycols for gas dehydration, call the nearest CARBIDE technical representative or write, Union Carbide Chemicals Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y.

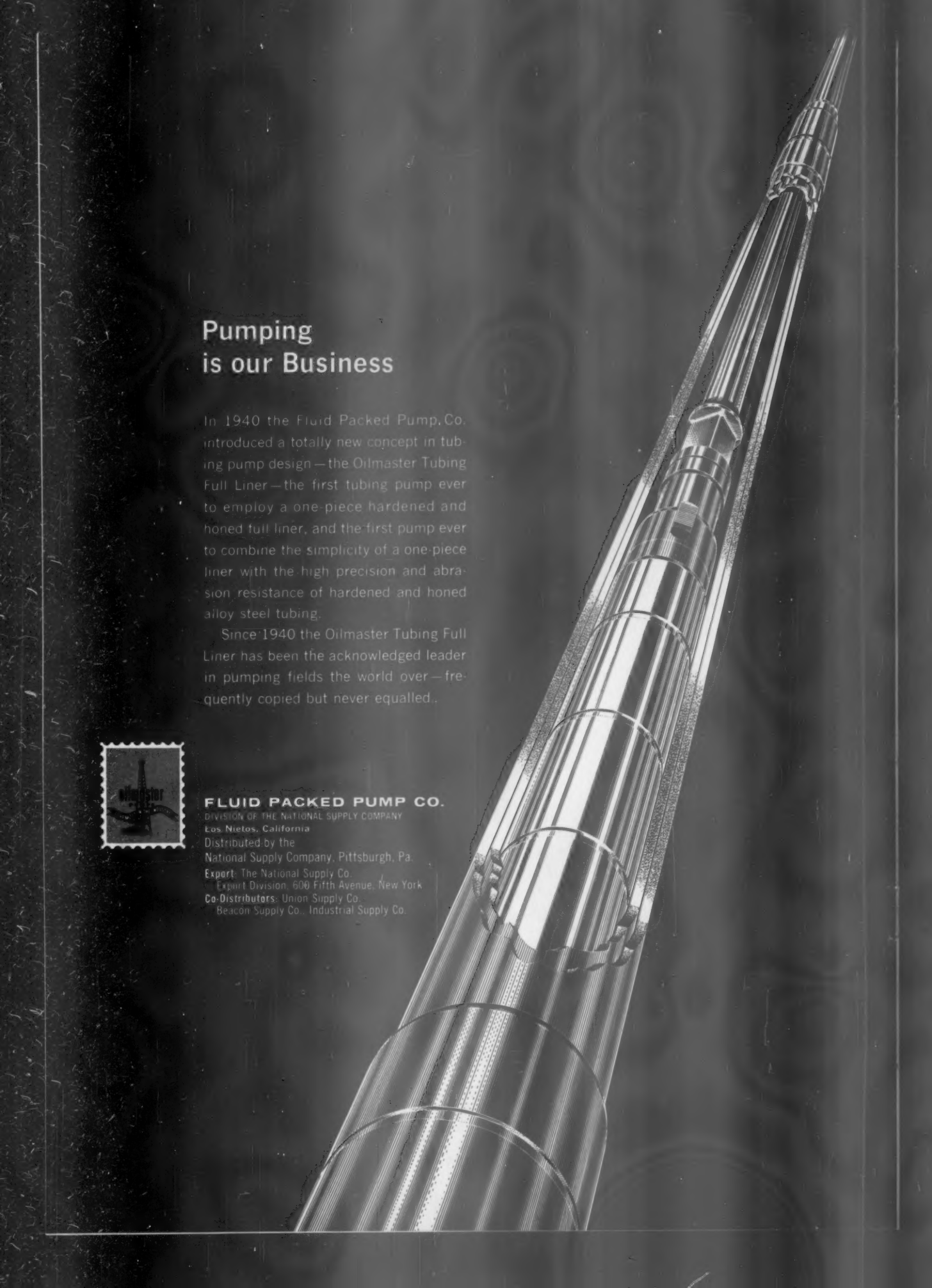
UNION CARBIDE is a registered trade mark of Union Carbide Corporation.

UNION CARBIDE CHEMICALS COMPANY

UNION CARBIDE

stam'-i-na vigor; capacity for enduring
WEBSTER

The exceptional stamina of the Oilmaster Subsurface Hydraulic Production Unit is not a result of chance. From swab nose to hold-down, this unit is designed with a capacity for enduring. In installations under a packer, in high gas oil ratio wells, and in wells where the fluid produced is abrasive, the Oilmaster Hydraulic operates at efficiencies previously believed impossible and with only a minimum of maintenance. Ask your Oilmaster representative about the stamina of this versatile unit. Have him tell you about the Flood Valve—how it eliminates fluid pound and lubricates the wear parts of the pump, or write for Bulletin E5903.


Pumping
is our Business
In 1940 the Fluid Packed Pump Co. introduced a totally new concept in tubing pump design—the Oilmaster Tubing Full Liner—the first tubing pump ever to employ a one-piece hardened and honed full liner, and the first pump ever to combine the simplicity of a one-piece liner with the high precision and abrasion resistance of hardened and honed alloy steel tubing.
Since 1940 the Oilmaster Tubing Full Liner has been the acknowledged leader in pumping fields the world over—frequently copied but never equalled.
Oilmaster
FLUID PACKED PUMP CO.
DIVISION OF THE NATIONAL SUPPLY COMPANY
Los Nietos, California
Distributed by the
National Supply Company, Pittsburgh, Pa.
Export: The National Supply Co.
Export Division, 600 Fifth Avenue, New York
Co-Distributors: Union Supply Co.
Beacon Supply Co., Industrial Supply Co.

A Nalco PRODUCT MANAGER Answers Questions About Refinery Desalting Practices and Economics

Apparently Efficient Desalting Operations May Be Hiding Big Operating Costs

Here are some questions about desalting that we are asked frequently in the field. Answers here are necessarily brief; but we believe Nalco has complete answers to virtually any conceivable desalting question . . . and we like to share them with refinery people . . .

Question: Why should refiners review desalting operations periodically?

Answer: Desalting can be a "sleeper" in many refineries, operating without the attention demanded by more complex processing—and sometimes doing an inefficient job that causes cumulative damage, or builds up operating costs unnecessarily. Periodic checks on desalting results and costs can be an important safeguard to overall operating efficiency.

Question: Is it reasonable to expect oil-free wash water effluent with an economical desalting operation?

Answer: Yes. Clean wash water effluent is one indication of effective desalting — but getting clean effluent does not need to indicate an expensive desalting operation.

Question: Can desalting chemicals be used with electrostatic desalting units?

Answer: Yes. They not only can be used, but with straight electrostatic desalting, results can be improved with the addition of small amounts of chemical. Nalco chemicals, for instance, have been used to treat charge stocks to electrostatic desalting equipment of all types for many years. Howe-Baker Engineers, Inc., a subsidiary of Nalco Chemical Company, designs and builds electrical desalting units; and their long, successful experience is shared by your Nalco Representative.

Question: How does Nalco treat the wide variety of crudes handled by some refineries?

Answer: Nalco's desalting chemicals are designed so that each is effective in treating a variety of crude types.

To select the best one for a refiner's present crudes (or those scheduled for future processing) screening tests are run at the refinery. Additional tests, if necessary, are performed at Nalco's desalting laboratory, using special equipment designed to reproduce actual refinery conditions.

The best chemical for the job is then chosen from Nalco's list of broad range formulas. It can be relied upon to do the best job at the lowest cost.

Question: Can Nalco chemicals increase throughput rates in existing desalting equipment?

Answer: Frequently. Whether existing equipment utilizes electrical desalting, chemical desalting, or a combination, improved chemical emulsion breaking can often speed up the desalting process . . . and, in effect, substantially increase the capacity of existing desalting equipment. In addition to boosting throughput, the use of Nalco Desalting chemicals has frequently enabled refiners to substantially reduce total chemical requirements.

Case histories in operations similar to your own may be of interest . . . and your Nalco Representative will gladly discuss them with you.

Nalco Product Manager for Petroleum Chemicals, R. C. Canapary, puts specialized knowledge to use in the field. Shown here (left) with one of the operating personnel of a large midwestern refinery, Canapary's expert assistance is an added assurance that Nalco desalting chemicals get results.

Question: Does Nalco have anything to offer where desalting is now satisfactory?

Answer: Yes: a careful check of desalting operations by a qualified expert. It may show that optimum desalting economy and efficiency is being maintained. Or it may reveal that greater economy or increased efficiency, or both, are possible. In either case, you will have an up-to-date, informed opinion of your desalting—at no cost to you.

Question: Just what does Nalco desalting service mean?

Answer: In terms of results, Nalco desalting service means continuously efficient desalting at lowest chemical costs. In setting up a desalting program, it means help from experts—in every phase of desalting technology. In terms of trouble-shooting, it means there is authoritative assistance available to you, now.

Where unusual desalting problems arise, Nalco service means the added skills and facilities of Nalco Laboratories, plus the concentrated attention of Nalco technical staff members whose principal jobs are solving special desalting problems and keeping Nalco Representatives ahead of the field in desalting know-how.

Regular testing continues where Nalco desalting chemicals are in use. The effort to better results and cut costs does not stop with the initial recommendations, nor is there the attitude of "letting well enough alone." You buy continuing *effort* and *responsibility* with every drum of Nalco chemical.

Why not put Nalco's expert desalting service to work for you today?

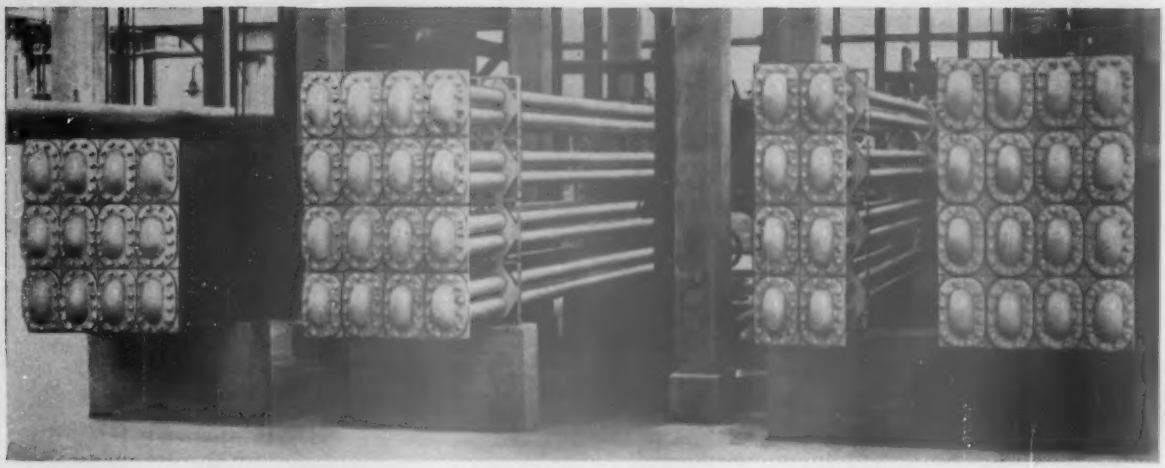
NALCO CHEMICAL COMPANY

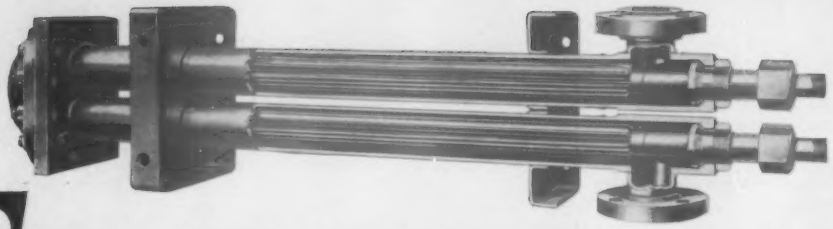
6242 West 66th Place • Chicago 38, Illinois

Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany
In Canada: Alchem Limited, Burlington, Ontario

Nalco ®... **Serving Industry through Practical Applied Science**

Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES
Nalco CHEMICALS
Nalco SERVICES





G-R Twin G-Fin Heat Exchanger Sections

Field proved by more than 74,000 units for practically all heating and cooling services

G-R Twin G-Fin Sections are easy to handle, easy to erect and require practically no servicing. They can be used singly or connected in series, parallel or series-parallel banks to provide any capacity desired. Any installation can be enlarged or reduced simply by adding or removing the proper number of sections. Sections not needed can serve as stand-by for sections on line, or used at other plants.

Use of our industry-proved extended surface G-fins overcomes unequal heating coefficients of fluids being handled, assuring more efficient heat transfer than if bare tubes were used, and the controlled flow through the longitudinal passages assures efficient operation. For the best performance by far, select G-R. Get full details.

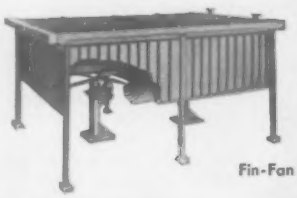
Write for G-R Twin G-Fin Bulletin No. 1401-R Today!

Griscom-Russell

THE GRISCOM-RUSSELL COMPANY
221 Wetmore Avenue, **Massillon, Ohio** • Phone TEmple 2-8751
Engineering and Sales Representatives in the Principal Cities

Also Manufacturers Of...

Reboilers



Fin-Fan Coolers

G-R Shell and Tube Heat Exchangers, Feedwater Heaters, Twin G-Fin Sections, Scale-Shedding Evaporators, Tank Heaters, After-coolers, Steam Generators, Ship and Land Base Sea Water Distilling Plants, Fin-Fan Coolers, Recuperators and Finned Tubing.

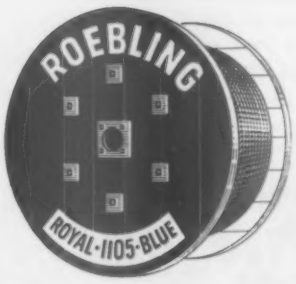
C. H. WHEELER Power Plant Condensers and Vacuum Equipment, Water Supply Drainage and Circulating Pumps, and Marine Auxiliary Machinery.

THE GRISCOM-RUSSELL CO.
Massillon, Ohio
C. H. WHEELER MFG. CO.
Philadelphia 32, Penna.
Subsidiaries of
HAMILTON-THOMAS CORPORATION
Hamilton, Ohio

ROEBLING ROYAL BLUE WIRE ROPE
DESIGNED AND MADE TO SERVE YOU WELL

This is the inside view of Roebling Royal Blue — its core has been removed to show the uniformity and symmetry of the rope structure. It's not only what's outside that counts; it's what's *inside* as well. You see how concerned we are with internal security.

All the inspections and tests that Royal Blue goes through enable us to know that the rope we build will do what we sell it to do. These quality control measures help us — as they do you — to take the *long* view of Royal Blue. A brochure on long-lasting Royal Blue, its resistance to shock, abrasion, crushing and bending, is available on request. Ask your Roebling wire rope distributor or write to Roebling's Wire Rope Division, Trenton 2, New Jersey.



ROYAL BLUE: *We put a lot of work into it—You get a lot of work out of it.*

ROEBLING

Branch Offices in Principal Cities • John A. Roebling's Sons Division, The Colorado Fuel and Iron Corporation

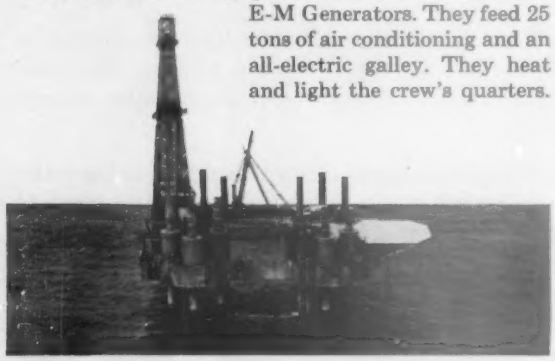
"Mr. Louie", designed by Universal Drilling Company and operated by Reading & Bates Exploration Company, gets its a-c power from two 300 kw, 0.8 pf, 900 rpm, 480 volt E-M Synchronous Generators.

Aboard offshore drilling rig "Mr. Louie", E-M Generators provide

Hard Working Horsepower, Easy Living "Housepower"

Working power aboard "Mr. Louie" comes from these two E-M Synchronous Generators. They supply power to the hydraulic jack system pump motors and to the many auxiliary motors pumping drilling fluids and water and compressing air. They also supply power for all lighting and communications.

"Mr. Louie's" living power comes from the same E-M Generators. They feed 25 tons of air conditioning and an all-electric galley. They heat and light the crew's quarters.



Hard working E-M Generators like these are widely used throughout the petroleum industry. Their extraordinary dependability has earned them acclaim among builders and operators of offshore drilling rigs. Built well above commonly accepted industry standards, E-M Generators require a minimum of attention.

They are backed by years of E-M experience in designing and building large, rotating a-c electrical apparatus for oil industry applications. Design simplicity and meticulous attention to detail assure you of long E-M Generator life and peak efficiency.

Call your nearby E-M Field Engineer for further information. He'll be glad to help you with any offshore a-c power problems you may have. Also, write the factory for a-c generator Catalog Sheet No. 259.

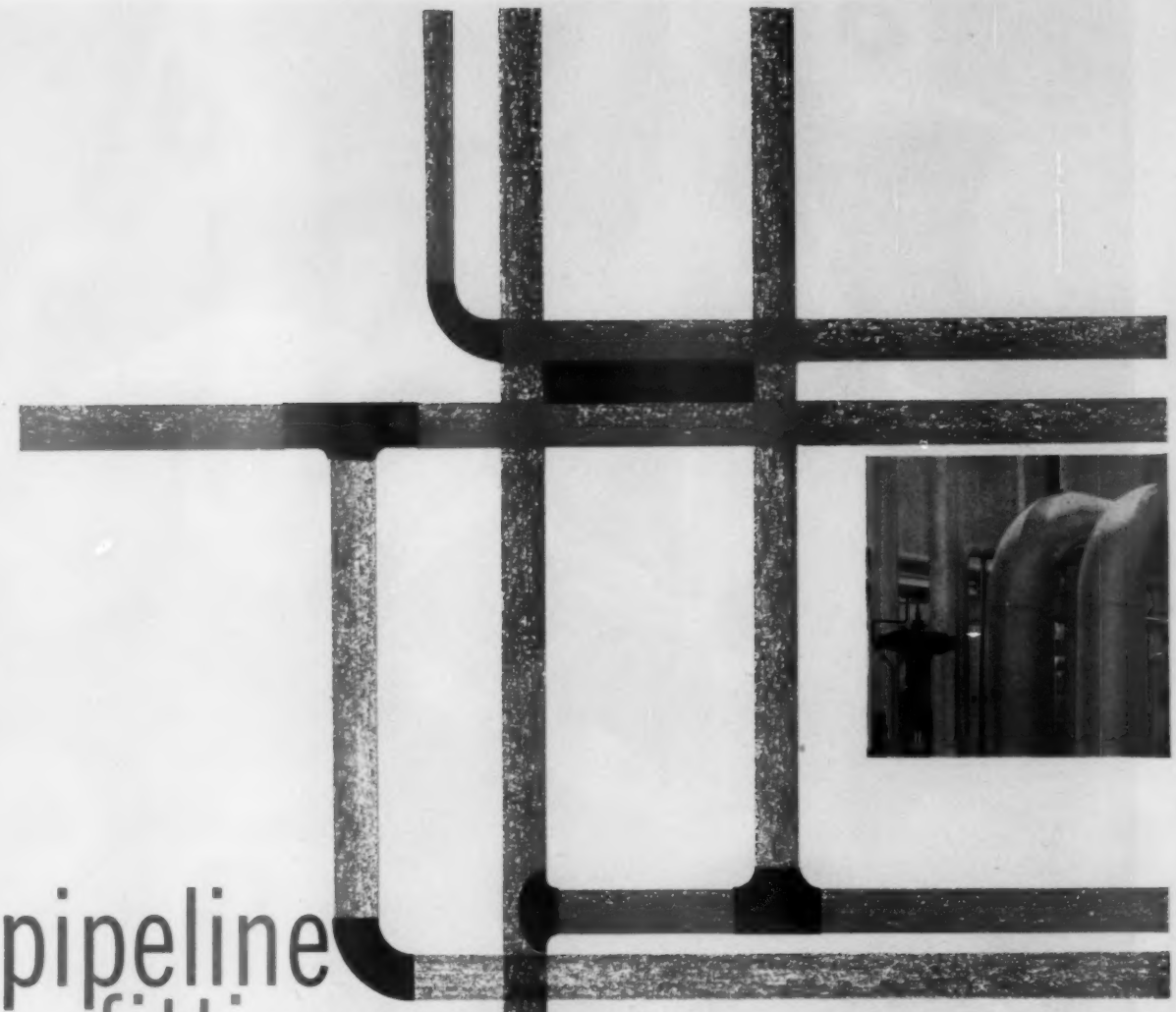
ELECTRIC MACHINERY MFG. COMPANY

Minneapolis 13, Minnesota

E-M

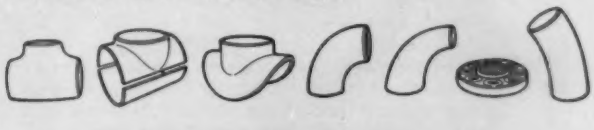
2100-TPA-2207

Specialists in making generators do **EXACTLY WHAT YOU WANT THEM TO**



pipeline fittings by Midwest

A COMPLETE LINE—featuring time and money saving Long Tangent "bonus ells"... wrap around saddles for hot taps ... reducing elbows through 30" size ... "Con-Tur" ells with extra long radius ... extruded headers, regular and extruded tees ... flanges of all types—special fittings too, including fittings for pig removal, with scraper bars, etc. Available in carbon steel, high yield metals, or alloys.



AVAILABLE FROM
STOCKING DISTRIBUTORS, COAST TO COAST

MIDWEST
PIPING COMPANY, INC.
1450 S. SECOND ST. • ST. LOUIS 4, MO.

1 MODEL 28 AUTOMATIC SEND-RECEIVE SET (ASR)—facilities for sending and receiving messages plus tape punching and reading. With this unit, messages can be prepared in punched tape ahead of time, then transmitted automatically at maximum line speed. The ASR set incorporates the major components of the Model 28 line in a single, compact console.

2 MODEL 28 SEND-RECEIVE PAGE PRINTER—for sending messages directly from the keyboard and receiving incoming traffic. Both this unit and the automatic send-receive set accommodate multi-copy, marginally punched business forms as well as plain message paper. Horizontal tabulation and form positioning arrangements available.

3 MODEL 28 TAPE READER—reads punched tape and instantaneously transmits data. As with all Teletype sending units, data may go to one destination or a number of destinations simultaneously—either nearby or thousands of miles away.

4 MODEL 28 TAPE PUNCH—punches data in "common language" tape—also prints the data on the tape, for easy identification and handling. Used for message relaying, combining data from several sources on a single tape, or providing punched tape as a by-product of send-receive operations for later use with business machines.

Are Your Communications Fast Enough?

Have you checked your communications system recently? Is it fast enough? Is the information available to all who need it—when they need it? Examples: sales orders, purchase requisitions, invoices, inventory records, management reports, operating data of all kinds. Today, such documents and data dominate the scene—and profitability is often dependent upon how swiftly and efficiently they can be handled.

Teletype equipment surmounts distances. Whether your communications are primarily inter-departmental or extend across the Country—Teletype equipment will provide you with quick two-way communications, and a printed record at both ends.

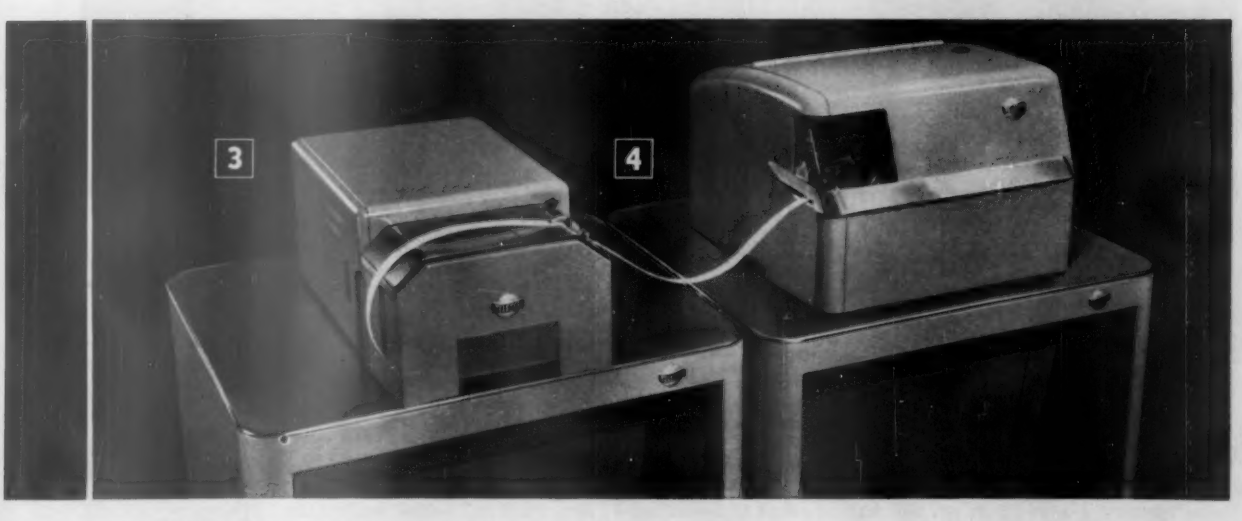
Moreover, by using multi-copy, marginally punched business forms in Teletype printers in place of plain paper, transaction time is further speeded and much paper processing eliminated. A punched tape can be produced at the same time, automatically, for later use in business machines, conversion to cards, etc.

Teletype equipment can send out your information on a "broadcast" basis. With a single typing effort, your data or messages are transmitted to as many destinations as desired, simultaneously—so that everyone is kept up to date. Data can also be collected from many points in rotation, regardless of geographical separation. For example, a Teletype equipment network is an ideal adjunct to a centralized computer operation.

Teletype Corporation manufactures this equipment for the Bell System and others who require the finest in data communications. Can be used with Data-Phone and other communications services.

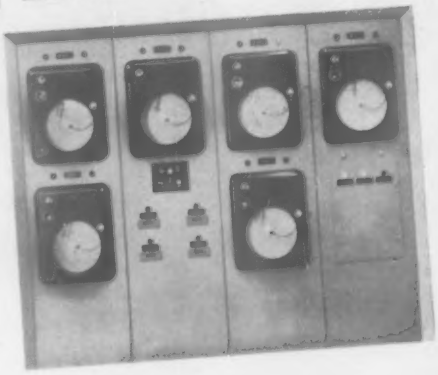
More Information. Write for descriptive brochure on Teletype Model 28 line to Dept. 94M, 5555 Touhy Avenue, Skokie, Illinois.

TELETYPE®
CORPORATION
SUBSIDIARY OF *Western Electric Company* INC.



American® Telemetering Equipment Means Operating Economy!

At this typical dispatching panel, one man does the work of many with American Telemetering and Telecounting equipment. At a central location, instantaneous, accurate flow and pressure readings are received from remote points and adjustments for load demands are made with remote-set controllers. Peak shaving can be performed with complete accuracy and confidence. Maximum gas sales to interruptible customers are assured.



AMERICAN®
METER COMPANY
INCORPORATED ESTABLISHED 1836

GENERAL SALES OFFICE: Philadelphia 16, Penna. • Albany • Alhambra • Atlanta Baltimore • Birmingham • Boston • Chicago • Dallas • Denver • Erie • Houston Kansas City • Los Angeles • Minneapolis • New York • Omaha • Pittsburgh • San Francisco • Seattle • Tulsa • Wynnewood

IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario • Calgary • Edmonton Montreal • Regina • Vancouver

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase, and Welded Steelcase Meters • American-Westcott Orifice Meters Instruments • Reliance Regulators • Apparatus • Valves

American Integrating Orifice Meters . . . Single, double and duplex-integrating models are available in a wide range of manometer types and working pressures.

American Series A-88 Controllers control flow, pressure, liquid level and other continuous process variables accurately, automatically and with a minimum of maintenance.

Whether your system is large or small, it will pay you to consult your nearest representative about the many economies American Telemetering Systems provide.

When you buy production equipment from Mid-Continent Supply Co., you know you're getting equipment that's right for the job. Mid-Continent unit installations are *engineered* for your exact needs, to your specifications. And Mid-Continent offers a single source of supply and service to keep your equipment operating efficiently from the first barrel to the last.

For complete information on the operating economy of top quality, engineered production equipment, call your nearest Mid-Continent sales engineer. Let him explain what we can do for you . . . around the clock . . . around the world.

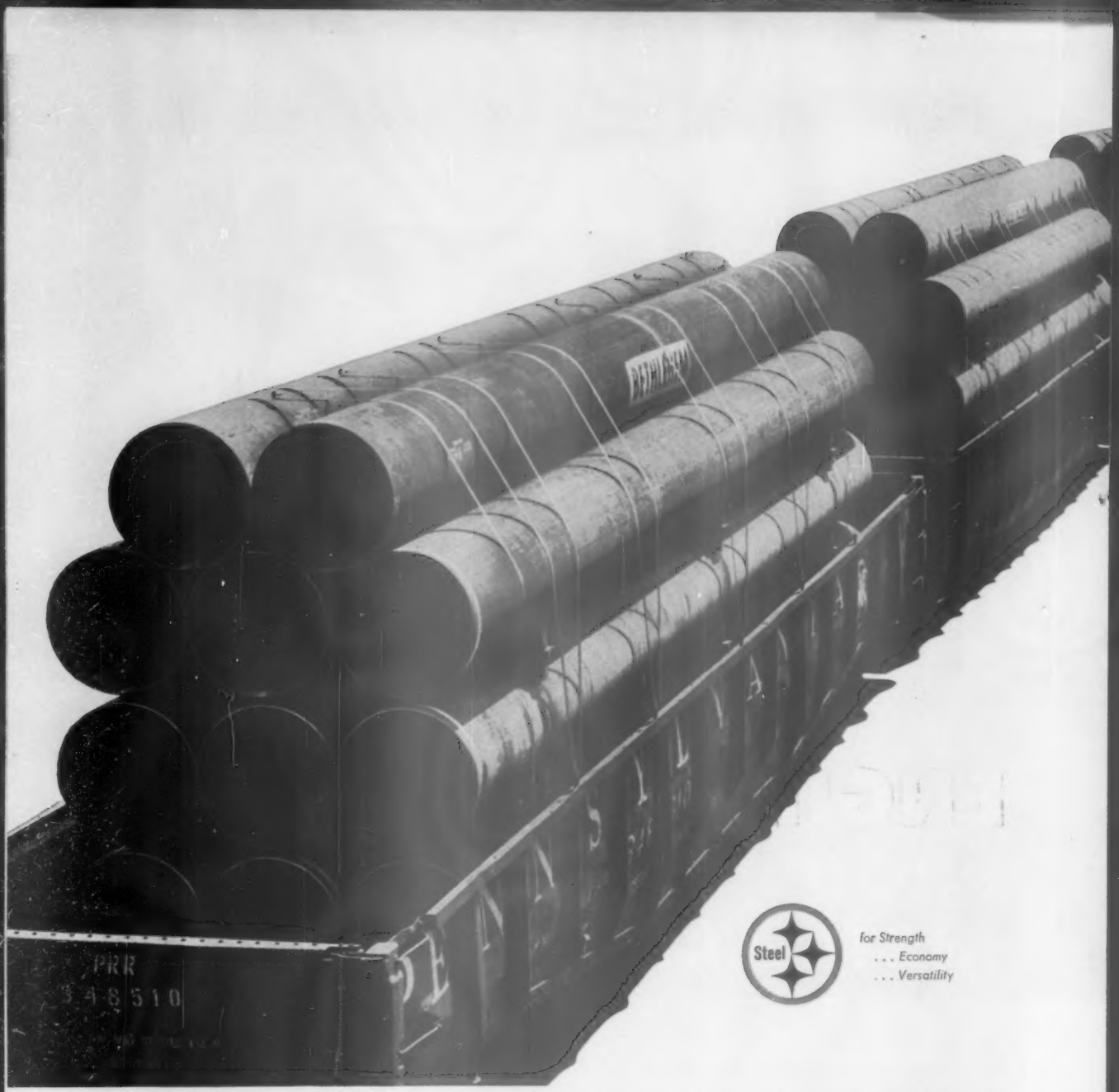
MID-CONTINENT - SUPERMARKET FOR THE OIL INDUSTRY

UP1-0

MID-CONTINENT SUPPLY CO.

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

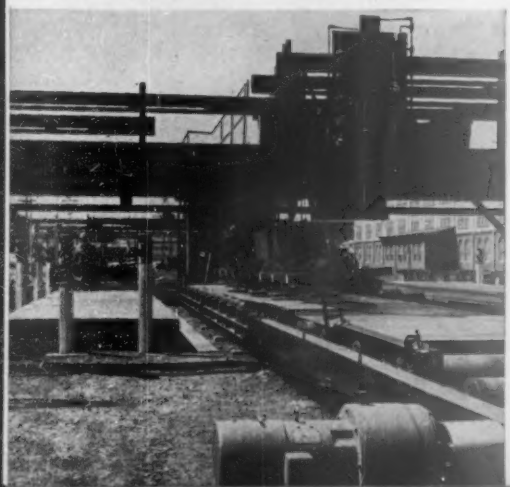
Mid-Continent Building, Fort Worth, Texas • Export Division: 45 Rockefeller Plaza, New York 20, N.Y. Cable: MIDCUMPORT NYK



Steel

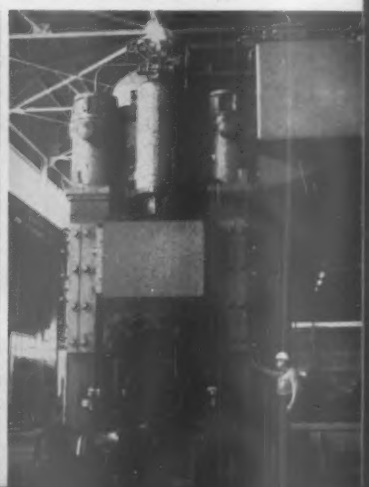
for Strength
. . . Economy
. . . Versatility

The 40-ft-long plates are handled automatically by this unique one-legged gantry, and delivered to the edge- and end-facing machines.



The prepared plates enter the U-ing press, where they are formed in a matter of seconds. Then . . .

. . . into the 18,000-ton-capacity hydraulic O-ing press. This machine can readily form plate ¾ in. thick.



BETHLEHEM LINE PIPE

Diameters to 42 in. OD . . . walls to 3/4 in.

We're now turning out electric fusion-weld line pipe (18 in. to 42 in. OD) in 40-ft lengths on our new mill at Steelton, Pa. The most modern in the industry, it assures Bethlehem customers of a plentiful supply of pipe meeting API 5LX specifications, as well as non-API pipe in the largest diameters and wall thicknesses presently available anywhere.

The mill's facilities, most of which are equipped with electronic controls, includes newly installed edge and end planers, U-ing and O-ing presses, and welding machines. The only "old" production facilities remaining are the hydraulic pipe expander and the end facer—both installed in 1957.

With this new mill in operation, Bethlehem can meet your most demanding requirements for quality, delivery, and size. The Bethlehem sales office nearest you will give you prompt action on your inquiries.

Line pipe to 16 in. OD made at Sparrows Point, Md.—Our modern electric resistance-weld mill produces API line pipe from 5-9/16 through 16 in. OD, in lengths to 60 ft. We also produce continuous buttweld pipe from 1/2 through 4-1/2 in. OD.

BETHLEHEM STEEL

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.

EXPORT SALES: Bethlehem Steel Export Corporation

One of the automatic submerged-arc welding machines making an inside seam. Not shown are the outside welders.

After thorough visual inspection, the 40-ft lengths are fed into the hydraulic expander. It can expand pipe 42 in. OD, with ¾-in. walls.

After fluoroscopic inspection, the pipe is end-faced as shown here. This operation assures the proper bevel for field-welding.

Crawler-wise "skinner" bets on TD-15 "special"

...rockets to favor with cost-conscious drillers!

When 23-year-old Charles Hailey, Stigler, Oklahoma decided to become a contractor, he already was a veteran 'dozer operator—with five years experience on oil field location and rig set-up jobs. And when he and Lorin Delap set up for business in early 1960, Charlie Hailey chose an International TD-15 Oil Field Special crawler—as their key equipment.

"I had experience with all the new rigs, working for other contractors," states Mr. Hailey. "So when I put up my own money, the International TD-15 was my choice.

"First, in operating a TD-15 more than 1,000 hours, I proved I could outwork other crawlers. The TD-15 carries bigger loads, moves around faster, has a good dozer and a fast winch.

"MAKES THE DRILLERS HAPPY"

"The '15' is easiest on the operator which means a lot on a 24-hour-day, hurry-up job. Work quality is also improved—I find it can make better pits with steeper slopes than any other tractor. This sure makes the drillers happy.

"The '15' dozer has the hydraulic power for prying out rocks. The big 6-cylinder engine never runs out of power.

"Second, and equally as important, is local distributor service. During my experience as an operator, we never had to wait for expert servicemen or parts on International rigs."

Prove to yourself that the 62-inch-gauge International TD-15 Oil Field Special crawler can work circles around competitive rigs. Compare the capacity of this 105-hp rig, equipped with 8-foot outside push-arm hydraulic bulldozer. See how features like the 6-speed full-reverse transmission—"single stick" shift—Shuttle-Bar control and decelerator—all speed up oil field jobs. Let your International Construction Equipment Distributor demonstrate.

The TD-15 owned by Hailey and Delap is shown completing a new drilling location in the Stigler area. This outfit cleared off trees; leveled the site, making fills as deep as five feet; dug the 200-foot square reserve pit *plus* two slush pits complete with dikes; cut a road to the river, cleared a site for the water pump. And the whole job took only 18 hours with the TD-15—which rocketed demand for the new firm's services!

Here's veteran crawler operator Charles Hailey, who put his money on the TD-15 when he and Lorin Delap became oil field contractors. "Experts figured my first job would take two dozers 30 hours," reports Mr. Hailey. "The TD-15 did it alone with time to spare at about one-third the competitive bid. We have been in demand ever since."

Only 96 inches over-all width, the TD-15 oil field special equipped with outside push-arm dozer is just right for digging pits—and for hauling without special permits. Outfit gives 20,500 lbs of push!

International®
Construction
Equipment

International Harvester Co.
180 North Michigan Ave., Chicago 1, Ill.
A COMPLETE POWER PACKAGE

ON-THE-RIG COMPARISONS SHOW J-M WILDCAT® PACKING KEEPS SLUSH PUMPS WORKING LONGER!

BECAUSE WILDCAT'S ENGINEERED DESIGN OFFERS A TIGHTER SEAL, LESS WEAR OF BORE AND ROD

Several drilling companies recently made on-the-job comparison tests. And J-M's rugged Wildcat outlasted all other packings tested!

In one typical case, others failed after 15 days of continuous service . . . while Wildcat provided a tight, efficient seal when it was removed for inspection after 20 days. Another test saw three other brands fail after only 8 to 40 hours. But Wildcat was still going strong after 112 continuous hours of service!

Wildcat's special design is the "secret" of its greater sealing efficiency. It not only improves the operation of your equipment . . . but it also results in longer life for both rod and packing. You get a tight, leakproof seal with less swell or bind . . . minimum friction . . . and highest resistance to abrasives and corrosives.

There are fewer interruptions for repacking. But when it's necessary, Wildcat's specially engineered design makes repacking so quick and easy that down-time is minimal.

Wildcat will surpass the performance and economy of any other packing you've ever used on your rig. See it at your field store, or write to Johns-Manville, Box 14, New York 16, N. Y. In Canada: Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Jefferson Gas Processing Specialist takes your problem to the laboratory

Specific analyses of amine solutions are often needed to pinpoint gas sweetening difficulties. After studying your problem, Jefferson's Gas Processing Specialist will know which analyses to recommend. Frequently, he will request samples to be sent to Jefferson's Austin Laboratories, where analytical equipment and specialized experience, not ordinarily found in plant laboratories, are available.

Let's say your sample is a lean diethanolamine solution and he needs to know such factors as: DEA from alkalinity before and after ion exchange; DEA calculated from Kjeldahl test for total nitrogen; analysis of other nitrogenous materials such as ammonia, thiocyanate, etc.; determination of heat stable salts present; viscosity; alkali metals; iron and iron capacity. Jefferson's Gas Processing Specialist requests and coordinates these tests. His detailed interpretations of the results are correlated with information on your specific operating conditions. Successful remedies to your problem most likely follow.

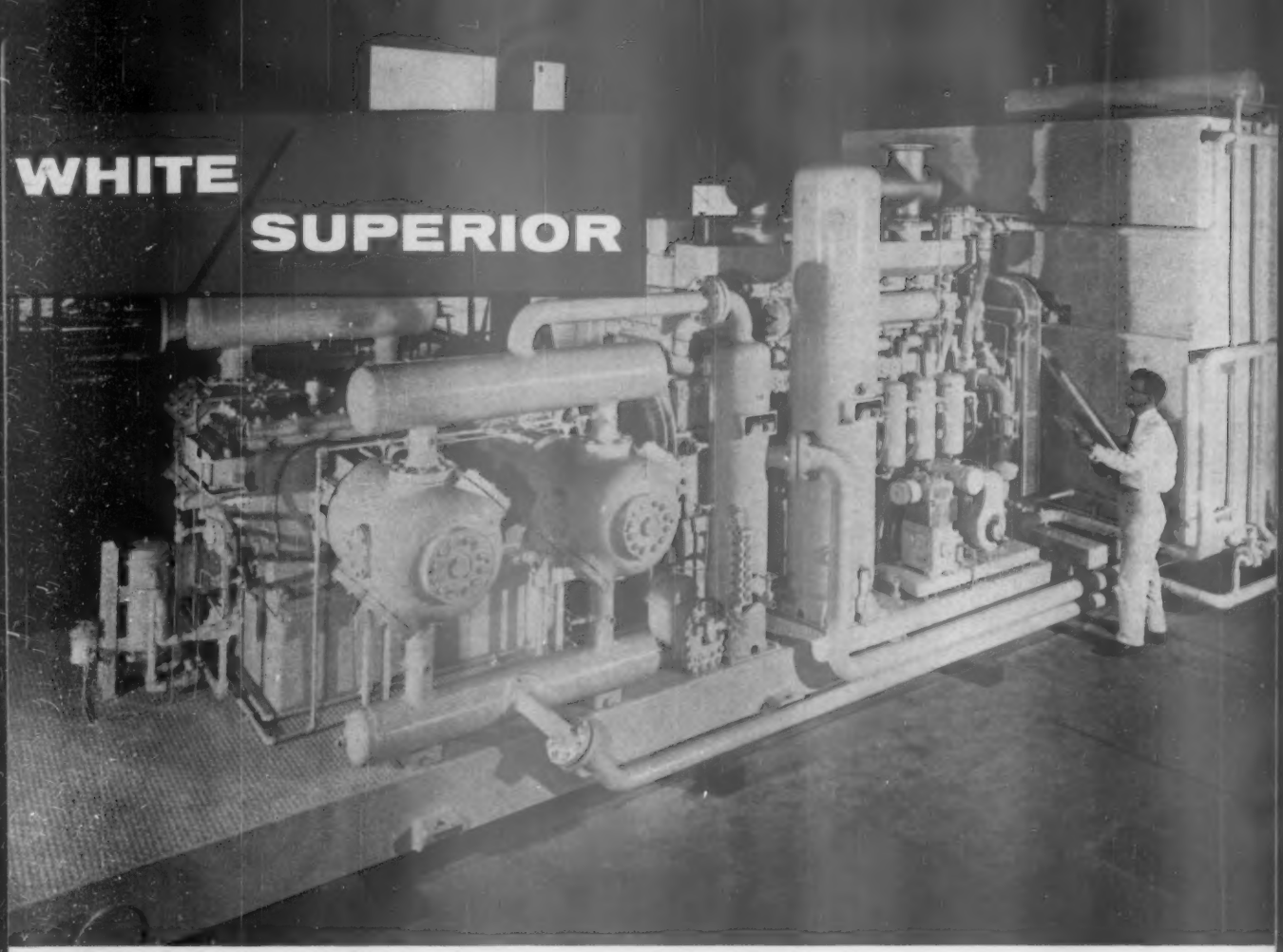
Prompt, dependable technical services plus ethanolamines and glycols in any quantity . . . they're yours from Jefferson Chemical Company, Inc., 1121 Walker Avenue, P. O. Box 303, Houston 1, Texas.

Ethylene and Propylene Oxides, Glycols, Dichlorides, Carbonates
SURFONIC® Surface-Active Agents • Ethanolamines • Morpholine
N-Alkyl Morpholines • Polyethylene and Polypropylene Glycols
Piperazine • Piperazine Salts • Nonyl Phenol • Caustic Soda

HOUSTON • NEW YORK • CHICAGO • CLEVELAND • CHARLOTTE • LOS ANGELES

JEFFERSON CHEMICALS

004



White Diesel, manufacturer of dependable, economical Superior engines—renowned throughout oil and gas fields for over 25 years, announces a new line of compressors. White compressors are medium speed, heavy duty, balanced opposed types, 200 to 1000 BHP, and are specifically engineered for combination with Superior natural gas engines.

The complete, compact, *matched design* engine-compressor package provides, continuous, heavy duty service for gas gathering, gas lifting, repressuring and booster applications. Two-cylinder and four-cylinder compressor models in a wide range of cylinder sizes can be ideally matched to Superior gas engine horsepower to meet your most exacting requirements.

Outstanding advantages...

MATCHED DESIGN Six inch stroke White compressors coupled to 9 inch and 10½ inch stroke Superior oil field gas engines provide optimum combinations of piston speed, horsepower and service life.

SINGLE RESPONSIBILITY White assumes complete responsibility for all engine-compressor parts . . . warrants both units one full year . . . offers factory service and replacements parts from its extensive oil and gas field service organization.

GREATER FLEXIBILITY Speed of direct-connected engines (no belts or gears) can be varied from 600 to 900 RPM for easy control of compressor output. Compressor cylinders can be easily changed on same frame to suit changing volume or pressure conditions.

EXTENSIVE CYLINDER RANGE Standard sizes range from 4000 PSI, 2⅝" dia. to 85 PSI, 22½" dia., providing 68 different cylinders. Custom sizes and designs also available.

MEDIUM SPEED POWER TO 1000 BHP Model W-62, two-cylinder compressor, ranges from 200 BHP with Superior 6G-510 gas engine to 635 BHP with 8G-825. Model W-64, four-cylinder compressor, is rated up to 1000 BHP with supercharged 8GX-825 gas engine.

CONTINUOUS HEAVY DUTY OPERATION Compressors are designed to accommodate 40 to 100% greater piston rod load than similar compressors. Rugged engine-compressors can run unattended, unprotected from weather, and can handle continuous operating loads and temporary overloads with ease.

Get new Compressor Bulletin 124 from White oil field representatives . . . or write today to White Diesel Engine Division!

WHITE DIESEL ENGINE DIVISION

THE WHITE MOTOR COMPANY

Plant and General Offices: Springfield, Ohio

635 H.P. Engine-Compressor Package.
Combination of Superior 8G-825 gas engine,
and White W64 four cylinder compressor.

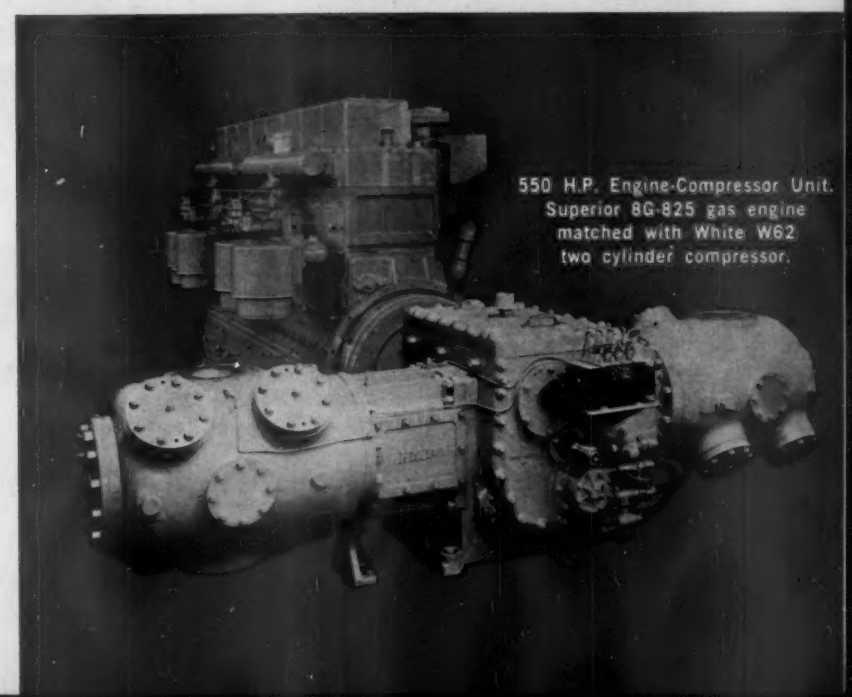
200 to 1000 BHP

Matched Design

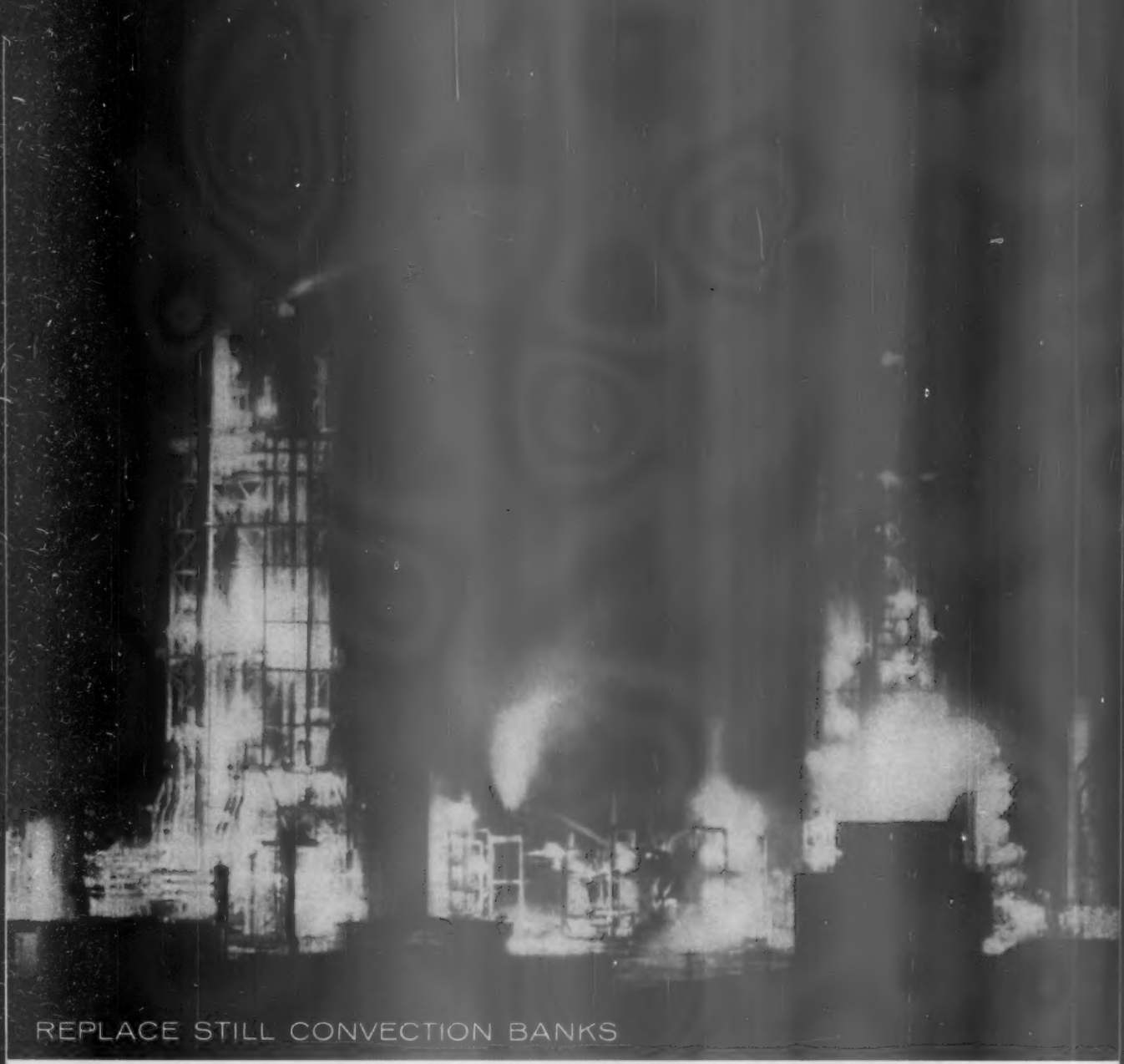
ENGINE-COMPRESSORS

White DIESEL

Superior ENGINES



550 H.P. Engine-Compressor Unit.
Superior 8G-825 gas engine
matched with White W62
two cylinder compressor.



REPLACE STILL CONVECTION BANKS

WITH A **LJUNGSTROM® AIR PREHEATER**

You can make major economies in the refining of corrosive crudes, or in any refining that involves very high temperatures, by replacing still convection banks with a Ljungstrom Air Preheater. This is how.

The radiant section of your still, operating with an Air Preheater, can deliver as much throughput (and possibly more) as was formerly possible using convection banks. And with an Air Preheater the oil tubes get the maximum amount of heat without the expensive heat- and corrosion-resistant alloys sometimes required for convection banks.

In addition, an Air Preheater provides other economies that you just don't get with convection banks. For example, an Air Preheater can cut fuel costs by 20%. It will promote high equipment availability by drastically cutting formation of slag and deposits. And an Air Preheater can take full advantage of the most modern fuel-burning equipment to give you much closer control of temperature—close enough to boost average product ratings as much as two octane numbers.

These extra savings can be almost pure profit, because you will probably save enough by eliminating or reducing convection banks to pay the cost of an Air Preheater installation.

Here's documented evidence. One company's fuel savings with a Ljungstrom Air Preheater are factually described in a published magazine article by O. F. Campbell. A reprint of this case history is yours free. Simply write to Air Preheater Corp.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

FIELD REPORT

FLOOD: Pegasus Unit

OPERATOR: Mobil Oil Company

PUMPS: Two Aldrich Septuplex

FLOODING STARTED: February, 1955

EXPERIENCE TO DATE:

Pumps continuously deliver brine to two formations — 90 gpm at 2,500 psi; 150 gpm at 1,000 psi. Customer reports: "Routine maintenance only. Aldrich pumps were selected because of previous dependable and economical service under high pressure operations."

Field parts stock available in Carmi, Ill.; Calgary; Casper, Wyoming; Charleston, W. Va.; Houston; Los Angeles; Odessa and Tulsa. For further information, write the ALDRICH PUMP COMPANY, 9 Gordon Street, Allentown, Pa.

the toughest pumping problems go to ALDRICH

J&L's Threefold

Service for Waterflooding

You have three good reasons for calling your J&L Supply man when considering a waterflood program.

First, J&L's waterflood engineering group has the background and experience for developing *practical* plans.

Second, J&L handles the equipment to carry out such plans. You get *real* economy. The J&L target is maximum recovery, with equipment designed for long life and dependable performance.

Third, you have J&L Supply stores where you need them, stocked with supplies and replacement parts.

This waterflood package offered by J&L Supply — experienced engineering, quality equipment and exceptional field service — is your assurance of maximum recovery at minimum cost.

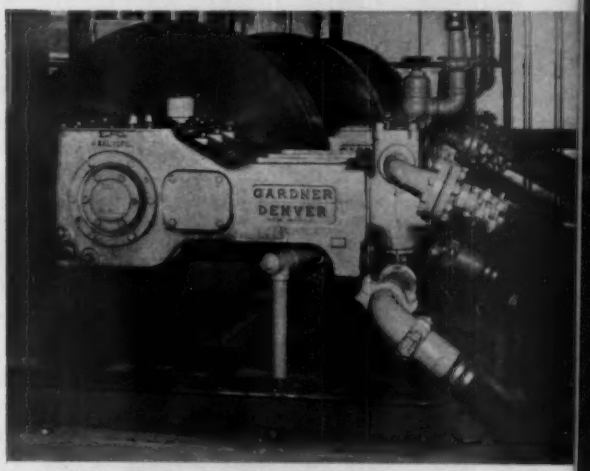
Jones & Laughlin

SUPPLY DIVISION – Tulsa

If it's sold by J&L....
It's the best available

84

J&L's waterflood engineering team plans for efficiency and economy in flood operations.



J&L's waterflood package includes only quality equipment — more trouble-free performance hours per dollar invested.

J&L's network of supply stores is your guarantee that supplies and parts are available where and when you need them.

J&L-designed and J&L-executed waterflood projects are the last word in efficiency and ultimate economy.

How one operator used D-Gassers to

reduce gas well costs by about $55,000

A Canadian operator — drilling deep gas wells in the Alberta foothills — is using the SWACO D-Gasser to save about $55,000 per well. Here is how he does it:

This operator, who was developing a gas field in the Alberta foothills, was encountering a gas-cutting problem during drilling that increased costs seriously. The problem was high-pressure, low-volume gas accumulations in a shale section above the main pay or between pay zones.

Until this shale section was reached, mud weight of 10 pounds per gallon was carried. When this section was being penetrated, however, severe gas cutting and "blowing" occurred. The gas cutting then persisted in the form of a two to three hour trip gas for the remainder of the well.

Practice before using D-Gasser

The operator circulated until he could build mud weight up to 11-13 pounds per gallon to control the gas cutting. Lost circulation in the pay section frequently occurred with the heavy mud, and a great deal of lost circulation material was often required. The cost of mud materials to control both gas and lost circulation ran $25,000 or more per well.

Initially, it took anywhere from two days to a week to condition the mud, and in one case it was necessary to set casing before drilling could proceed. In addition, several hours of rig time were lost after each trip gunning out the trip gas.

Practice when using D-Gasser

With a D-Gasser installed, the operator merely starts it up when the gas cutting occurs. Occasionally the preventers have to be closed, and the well placed on choke for a few hours. However, the whole job of mud conditioning can be accomplished in less than one day without increasing the mud weight. Moreover, penetration rates and bit life while drilling using the lower weight muds are substantially improved. Total savings in drilling costs amount to approximately $30,000 per well.

To summarize, the operator has found he saves $25,000 or more in mud costs and something like $30,000 in rig time and other drilling costs.

This case is just one of many examples that prove the SWACO D-Gasser is more than just a safety device to be used for wildcat drilling. It makes possible important reductions in overall well costs in any area where gas cutting is a problem. Contact your nearest SWACO representative to find out just how much D-Gassers can reduce your costs. Also ask him how SWACO Clayjectors and D-Sanders can further reduce drilling costs.

SWACO

SALT WATER CONTROL, INC.
1809 CONTINENTAL NATIONAL BANK BLDG., FORT WORTH 2, TEXAS
Telephone: EDison 2-4433 Cable Address: "SWACO" Fort Worth

LOUISIANA: New Orleans, Lafayette
OKLAHOMA: Oklahoma City
TEXAS: Houston, Corpus Christi, Fort Worth, Kermit
COLORADO: Durango

Charter member of the "globe-spanners"

YESTERDAY—Texaco began serving aviation, long before air travel was a way of life. Captain Frank Hawks, famed early flier, was Texaco's aviation specialist for many years. In 1930 he spanned the continent in Texaco No. 13. Time: 12 hours, 25 minutes, 3 seconds!

TODAY—Airline jets span the United States in less than five hours...many flying on Texaco fuels and lubricants. In fact, since the beginning of commercial aviation, millions of scheduled airline miles have been flown on Texaco aviation products.

TEXACO

HAVE YOU TAKEN SIDES IN THE BELT DRIVE REVOLUTION?

The change from Multi-V to Multi-Wedge is revolutionizing belt drives. A simple change in shape gives the Wedge Belt greater efficiency. Thus the number of belts can be less, diameters can be reduced 30 to 50% and center distances cut 20% for the same transmitted horsepower. In fact, Multi-Wedge drives result in initial savings up to 20%.

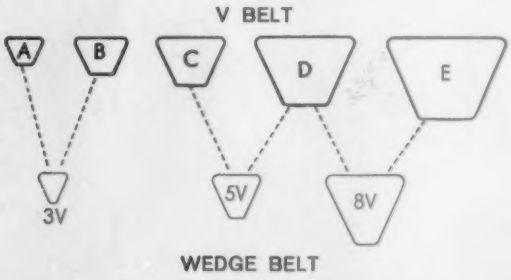
Because of this potential saving, it's to industry's advantage to design Wedge-Belts into new equipment as soon as convenient. But Worthington will supply complete requirements in both Multi-V and Multi-Wedge drives until the latter has completely taken over.

Are you worried about interchangeability of brands? Frankly, five out of the eight leading drive manufacturers now offer Multi-Wedge, as well as the Multi-V drives. And so far, all Multi-Wedge drives are offered in the same belt and sheave sizes.

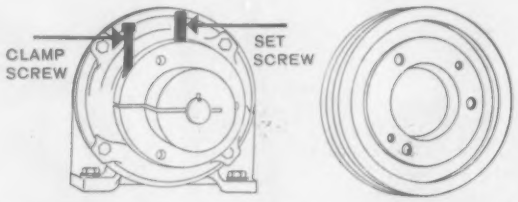
There is, however, an important reason for preferring the Worthington Multi-Wedge drive. Worthington makes the QD (Quick Detachable) sheave—the industry's largest seller—in the complete range of Multi-Wedge standardized dimensions. This sheave, with its two Golden Screws, appeals to plant operators because of its positive locking arrangement—easy on . . . easy off . . . always tight.

For Multi-Wedge drives, Worthington maintains a large stock of its QD sheaves and Worthington-Goodyear Wedge belts from coast to coast. For information call your Worthington distributor listed in the yellow pages of your phone book. Or write Worthington Corporation, Section 79-28, Oil City, Pennsylvania.

The cord layer near the top of either belt carries the load. This layer is, however, only efficient in the portion supported by side walls (red areas). Because more of its top section is over the side walls, the Wedge belt is more efficient than a V belt.



Because the smaller Wedge belt does more work, the number of sizes have been reduced without loss of flexibility. The new Wedge belts are available in three standard sections: 3V, 5V and 8V. Stock 3V and 5V sheaves cover horsepower ranges through 200 hp. Made to order 8V sheaves will be used for 200 to 2,000 hp. requirements.



Worthington QD sheaves are preferable for Multi-Wedge drives. The clamp screw simplifies installation, assures permanent alignment, and makes it possible to use a set screw without causing hub distortion that might cause eccentric runout. The set screw prevents "key drift" by locking the key securely in place. You install QD sheaves easily—one part at a time. If change in speed is required, you simply install another sheave on the hub which remains anchored to the shaft.

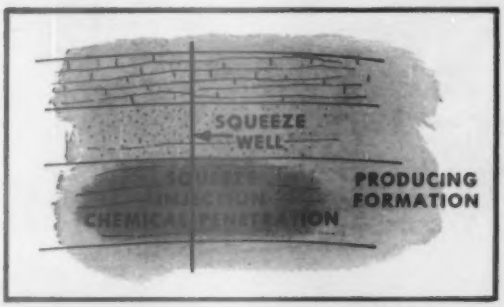
WORTHINGTON

Visco Squeeze Treatment Chemicals Designed to Fit Varying Well Conditions

Corrosion Control Lasts, Costs Less with New Visco Formulas, Methods

Squeeze treatment in producing wells continues to grow in importance as an economical, long-term method of obtaining effective corrosion control. It is simply the pressure injection of corrosion inhibitor chemical into the producing formation, from which it is released in approximate proportion to produced fluid volume over a period of time—anywhere from two to sixteen months.

Visco has found squeeze treating of sufficient interest to producers to justify development of specialized chemicals and techniques to permit most effective use of the method.



Squeeze technique forces chemical corrosion inhibitor into formation around well bottom. Chemical is carried back with produced fluid. The excellent film persistency of Visco squeeze treating chemicals assures long-lasting, low-cost well protection.

Effects of Formation

Producing formation composition, porosity permeability and position can have an important bearing on the success of squeeze treatment corrosion control . . . They are important considerations in the development of special Visco formulas for this purpose.

Determining Chemical Type

As with any operation affecting producing formations, experience is the most dependable guide. Chances are great that the conditions you have in your area have been closely paralleled by other Visco squeeze treating experience. Further, Visco Formulas such as

Visco's J. P. Stanton, Product Manager for Corrosion Control Chemicals, discusses factors considered important in assuring effective squeeze treatment.

S-1390X, 956, S-1339X, were developed to broaden the effectiveness of corrosion control with squeeze treatment, and so are a big help in pinpointing the best chemical and method to apply to specific well characteristics.

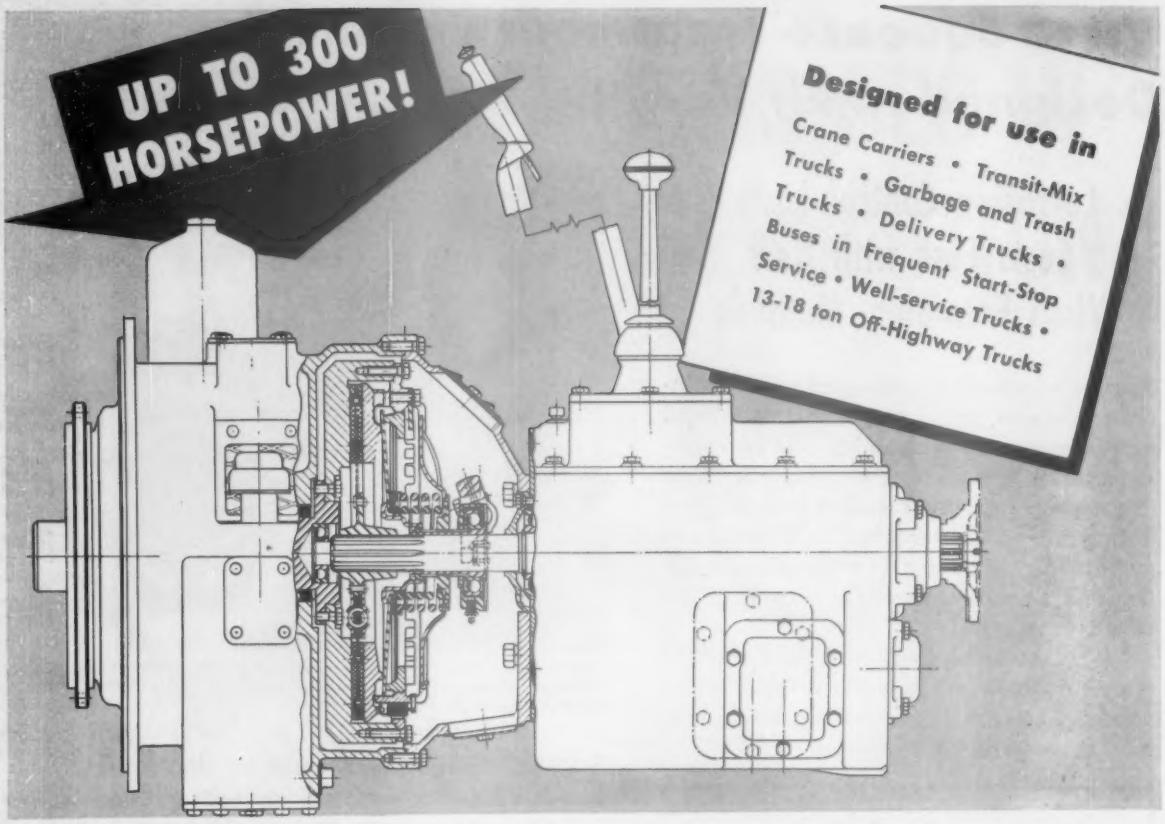
Field Experience

Squeeze treating can offer some substantial cost and time advantages for effective corrosion control in many types of producing wells . . . BUT, probably more than any other treating method, squeeze treatment demands skill and experience, as well as effective chemicals, to assure success. No one is better equipped than Visco . . . *we* firmly believe no one else can do as well for you.

Help, Now

Visco action toward being useful in your activities is as close as your phone—and nearly as quick as picking it up. Your move.

VISCO PRODUCTS COMPANY
Incorporated
A Unit of Nalco Chemical Company
1020 Holcombe Boulevard **Houston 25, Texas**
Deutsche Nalco-Chemie, G.m.b.H., Frankfort, Germany
Nalco Italiana, S.p.A., Rome, Italy
Nalco de Mexico, S.A. de C.V., Mexico, D. F. Mexico
Nalco de Venezuela, C.A., Caracas, Venezuela
Visco. . . . *Serving the Oil Industry through Practical Applied Science*


UP TO 300 HORSEPOWER!
Designed for use in
Crane Carriers • Transit-Mix Trucks • Garbage and Trash Trucks • Delivery Trucks • Buses in Frequent Start-Stop Service • Well-service Trucks • 13-18 ton Off-Highway Trucks

NEW Torque Converter—Transmission Packages from TWIN DISC

- ***Choice of standard mechanical transmissions—Fuller, Spicer or your own design***
- ***Standard mechanical spring loaded clutches—Lipe or Spicer***

Twin Disc's new torque converter-mechanical transmission units are the result of a design project in which Twin Disc engineers worked in close cooperation with engineers of leading transmission manufacturers. What they perfected is a "package" designed to meet specialized power transmission needs—the needs of vehicles engaged in frequent start-stop service or subject to wide variations in load conditions.

With a Twin Disc converter-transmission package, users of such vehicles can realize these important benefits:

- Automatic torque multiplication in all gear ratios
- Sudden load increases easily handled without shifting gears
- Smooth, effortless starting—engine stalls completely eliminated
- "Fluid cushion" protection throughout the drive train for less downtime, longer life
- Increased driver efficiency because operation is far less fatiguing

The new Twin Disc package offers several advantages over other converter-transmission units. Capacity range is greater—up to 300 hp and 650 lb-ft of torque. Furthermore, Twin Disc permits the user to select the make of transmission he prefers. A third "plus" feature is the fact that Twin Disc uses a standard spring-loaded clutch which provides the familiar "feel" that vehicle operators want.

Twin Disc engineers will be glad to work with you in adapting this converter-transmission package to your vehicle's requirements.

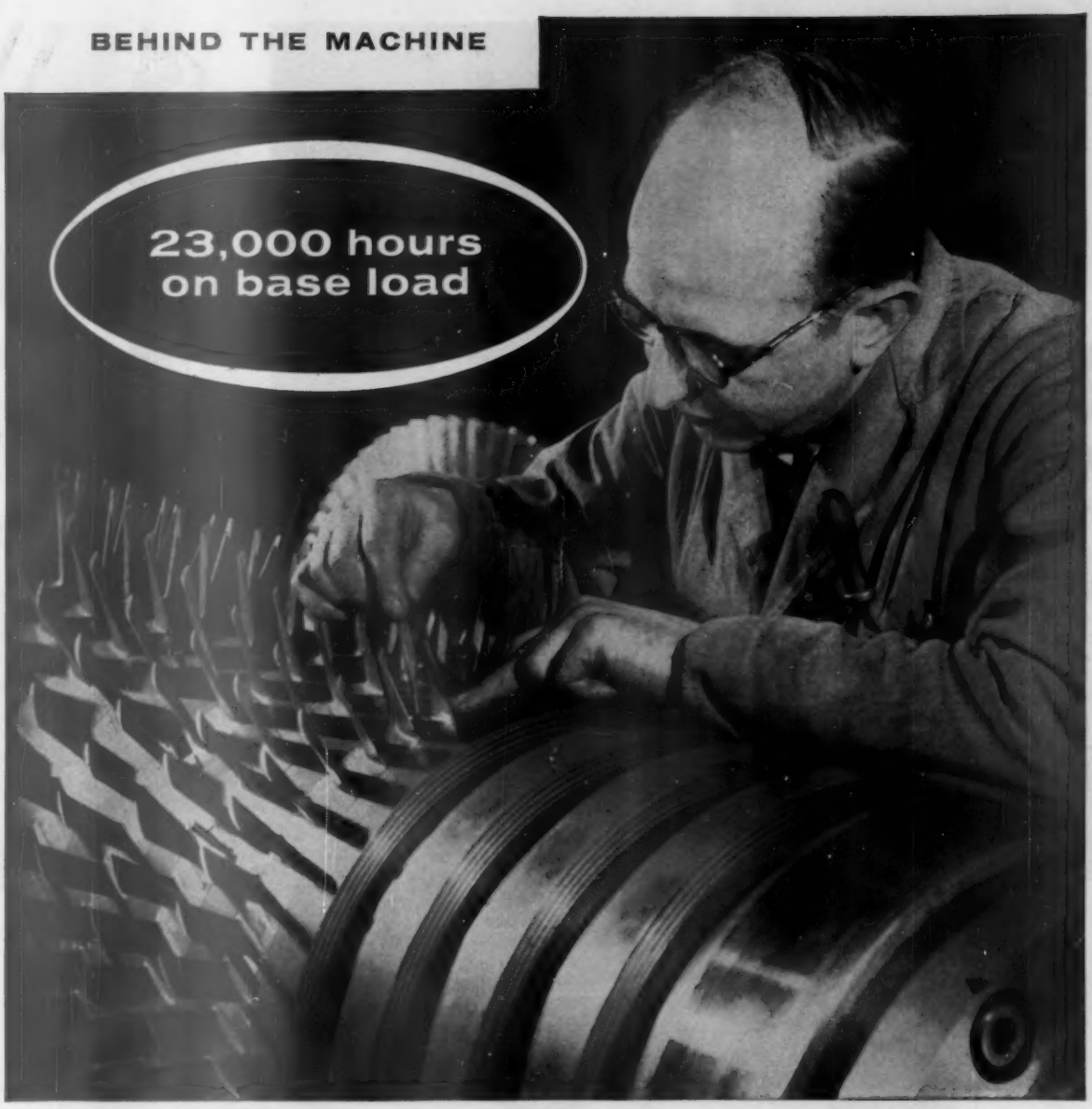
Send for Bulletin 511

TWIN DISC
POWER TRANSMISSION EQUIPMENT

TWIN DISC
Torque Converters

TWIN DISC CLUTCH COMPANY
RACINE, WISCONSIN
HYDRAULIC DIVISION, Rockford, Illinois

BEHIND THE MACHINE



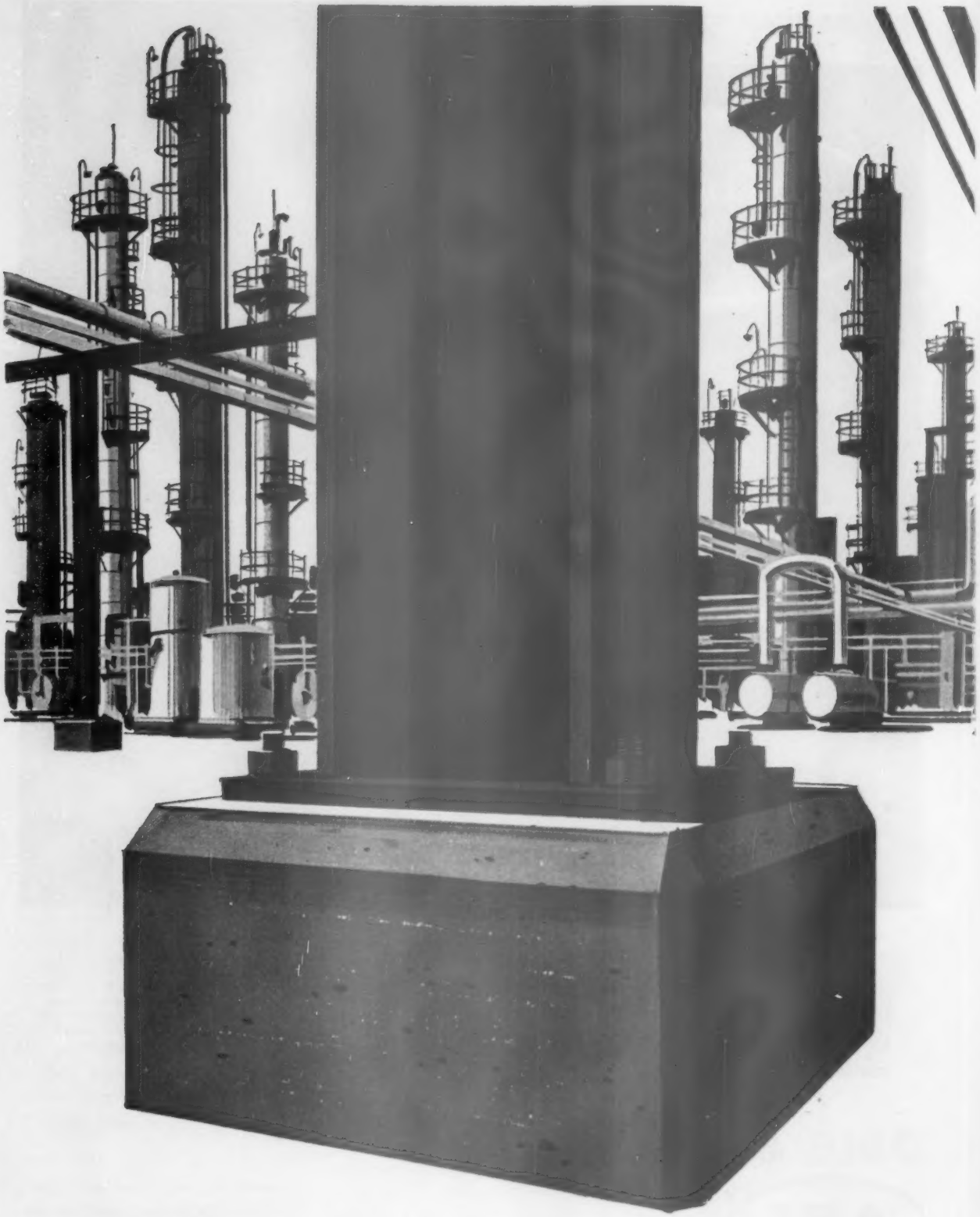
The proved reliability of AEI industrial gas turbines is typified by a machine in Venezuela which has recently completed 23,000 hours running on base load. AEI makes a range of industrial gas turbines with ratings from 1,750 kW upwards designed to run on gaseous or liquid fuels.

The picture shows work on the compressor rotor of L2IC gas turbines being built, at the AEI Turbine-Generator Division Factory for the Basrah Petroleum Co. These feature a single shaft design which ensures stable regulation and makes them particularly suitable for parallel operation with other generating equipment.

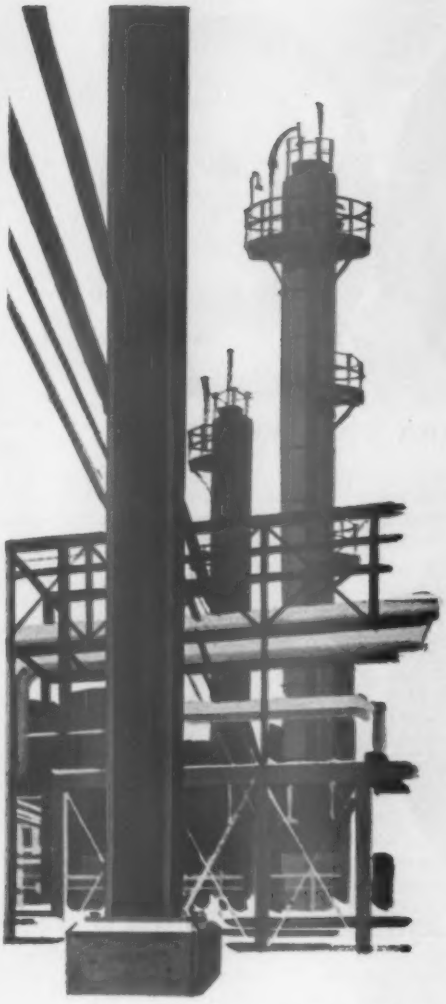
This is a product of AEI Turbine-Generator Division, Britain's largest manufacturer of Turbine-Generators.

AEI Associated Electrical Industries Export Ltd
33 GROSVENOR PLACE, LONDON SW1

B/L002



Foster Wheeler ***Heat Engineered*** **products, plants and processes... for the world's industrial progress.**



Best foundation for process profitability

What is the best insurance that your new process plant will produce "as planned"?

When Foster Wheeler is your "planner" there is experience with the design, construction and start-up of 75 different processes—in more than 800 plants throughout the world—to provide a sound basis for every detail.

This experience covers every conceivable operating condition: temperatures, pressures, corrosion, erosion and others. The problems of equipment design and world-wide procurement have been met and solved, over and over again.

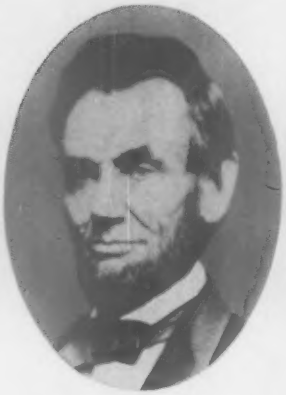
When Foster Wheeler designs, engineers and constructs your process plant, *experience* is the foundation for process profitability.

FOSTER WHEELER

NEW YORK LONDON PARIS ST. CATHARINES, ONT.

Which President appears on a ten-dollar bill?

THOMAS JEFFERSON



ABRAHAM LINCOLN

ANDREW JACKSON

ULYSSES S. GRANT

WILLIAM McKINLEY

GROVER CLEVELAND

JAMES MADISON

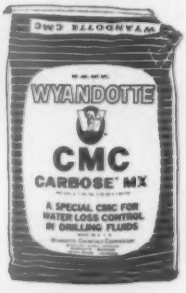
Can you tell the real thing when you see it?

Check a ten. The answer is there.

Next question: Which CMC is made for mud? Answer: Wyandotte CARBOSE® MX. It's a special grade of CMC developed specifically for drilling muds. Salts normally encountered in drilling don't precipitate it. Bentonite shows little tendency to swell in muds that contain it. Carbose MX does all the things CMC is supposed to do for drilling muds. Check for yourself. Try Carbose MX.

Wyandotte offers a number of drilling mud additives, as well as materials for gas dehumidification, demulsifying, emulsifying, secondary recovery, water treatment, cementing, sweetening, and many other petroleum, refinery, and petrochemical applications. Get full details from your distributor, or write: *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Baton Rouge, Louisiana. Offices in principal cities.*

ANSWER: No President. Alexander Hamilton appears on our ten-dollar bill. Other denominations and portraits are: Washington—$1; Jefferson—$2; Lincoln—$5; Jackson—$20; Grant—$50; Franklin—$100; McKinley—$500; Cleveland—$1,000; Madison—$5,000; Chase—$10,000.



WYANDOTTE CHEMICALS

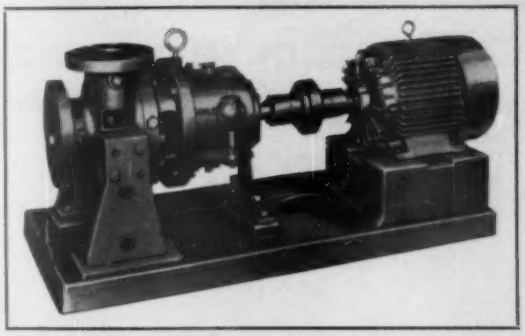
MICHIGAN ALKALI DIVISION

PACING PROGRESS WITH CREATIVE CHEMISTRY®

THIS IS INTERMEDIATE-RANGE DESIGN

Robert Fornesi, Senior Application Engineer, Goulds Pumps, Inc.

Changing requirements created this third dimension in process pump selection



Once upon a time you had to meet petroleum process applications with pumps in only these two ranges: (1) Light duty pumps to handle temperatures up to 200° or at most 300°. (2) Real heavy duty pumps for 200° to 800°. That's changed.

Here's why. Goulds product development group appraised the growing range requirements and services of petroleum process pumps. They found that 200° was no longer a realistic dividing line for process pump types. The need was for one pump which would handle all light duty applications and the growing number of intermediate applications as well.

Why should you have to buy a light duty pump with built-in temperature limitations when an intermediate-range pump could be built for almost the same price? Why should you pay for an 800° heavy duty pump to handle all the applications above 200° or 300°?

THIS DESIGN SOLVES HIGH TEMPERATURE SEAL PROBLEMS

Goulds designers felt they had the answer to both these questions in their plans for the Model 3775 line. This was not enough.

The design concept was verified by field research. The plans were rolled up from the drawing board and flown and shown all over the country. Plant superintendents and operating engineers saw them. They said yes.

They liked the rather obvious ideas that made INTERMEDIATE DESIGN POSSIBLE . . . the mechanical seal isolated in a seal chamber. This to allow for cooling of the liquid within the seal chamber. It made higher temperature handling with mechanical seals possible as it protected the seal. In similarly priced pumps the mechanical seal area behind the impeller is wide open. The hot pumpage is in constant contact with the seal. With the Model 3775 seals are not exposed to direct contact with hot pumpage. Cooler seals mean longer seal life.

COOLED CASING SUPPORT . . . A PLUS FEATURE

This was not enough. To be completely fit for INTERMEDIATE-RANGE (up to 650°) applications the Model 3775 had to have these features of costlier heavy duty pumps—cooled bearings and casing support.

Goulds Model 3775 has them all—water-cooled bearing housing and casing support as well as the seal chamber. This plus the choice of either internal or external flushing of the seal chamber. Single, double, balanced or unbalanced seals available to properly fit the application.

The pump is back pull-out type for easy maintenance. A spacer coupling allows you to remove the rotating parts without disturbing pipe connections or driver.

Built in accordance with API 610 specs, the fine mechanical features of this pump provide a husky line of pumps with maximum standardization and interchangeability of parts. Eleven sizes are built on the same bearing frame.

The Model 3775 is a horizontal center line mount with vertically split casings. Renewable casing wearing rings maintain proper clearance with impeller wearing rings. Leakage between suction and discharge chambers of the casing can be held to an absolute minimum.

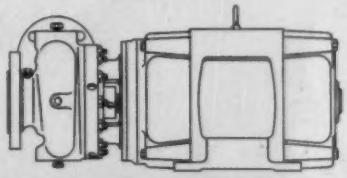
Talk over your process handling methods and problems with your Goulds engineer. He'll show you many more reasons why the INTERMEDIATE-RANGE 3775 is your best process pump choice for the majority of applications . . . *why it makes light duty pumps obsolete.* How it better fits the growing range of your process requirements.

AND AT LAST . . . A CLOSE-COUPLED PROCESS PUMP!

Goulds Model 3675 is the close-coupled version of the 3775. These units use the same liquid end as the frame mounts. The 3675 casing may be swiveled to four different discharge positions.

This integral pump-motor design provides the maximum in economy and compactness. Flexibility, too! One of our customers changed a process. A steel-case pump was required. Buy all new units? No, Goulds Model 3675 liquid ends fitted on the customer's present motors and provided the same rating. Only the casing was changed.

Get the complete story on these new pumps and all the others in the modern Goulds line. Send our factory the coupon below.



GOULDS PUMPS

GOULDS PUMPS, INC. Dept. 06J-120, Seneca Falls, N.Y., U.S.A.

Send me a bulletin with complete application data on your INTERMEDIATE-RANGE DESIGN petroleum process pump.

Anything else? Please check.

- ☐ 1-stage centrifugal—Model 3405
- ☐ 2-stage centrifugal—Model 3305
- ☐ Steel case Pumps Bulletin

NAME _____ DEPT. OR TITLE _____

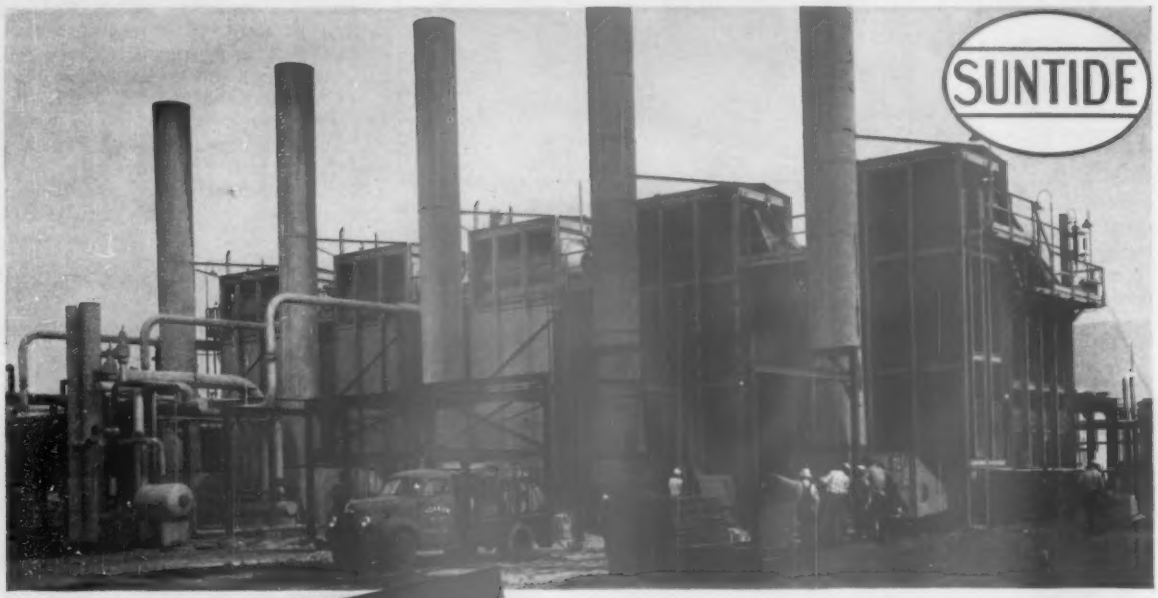
COMPANY _____ ADDRESS _____

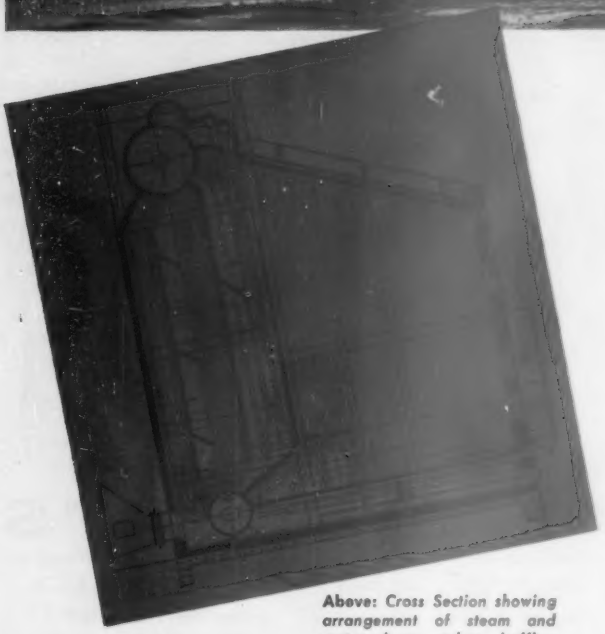
CITY _____ ZONE _____ STATE _____

STEAM GENERATORS

at SUNTIDE REFINING COMPANY

Viola, Texas





Above: *Cross Section showing arrangement of steam and water drums, tubes, baffles, and furnace.*

6 EFFICIENT AND ECONOMICAL UNITS SERVE THIS MODERN REFINERY

Principle Data Each Unit

- 85,000 pounds steam per hour capacity, designed for 500 lbs. S.W.P. and 625° F. total temperature.
- Water cooled furnace.
- Burners for Gas and Oil fuel.

Vogt offers a complete line of custom built and package type steam generators. Available in bent tube and straight tube designs for solid, liquid, or gaseous fuels burned singly or in combination.

Write for bulletins. Dept. 24A-BO

OTHER VOGT PRODUCTS

Forged Steel Valves, Fittings and Flanges—
Petroleum Refinery and Chemical Plant Equipment
Heat Exchangers
Ice Making and Refrigerating Equipment

HENRY VOGT MACHINE CO.

Box 1918, Louisville 1, Kentucky

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J. St. Louis, Charleston, W. Va., Cincinnati, Los Angeles.

Cylindrical plug prevents wedging in W-K-M's ACF® Lubricated Plug Valve

With *no* taper, the W-K-M plug can't wedge, can't unseat. *This cylindrical plug can only rotate* — like a journal in a well-lubricated bearing. Result? Even with abrasive ladings the valve remains continuously lubricated and free-turning . . . sealed by a film of grease around the plug and a ring of Teflon at the head.

Wherever service is demanding, or interruptions are costly, specify the valves that *can't wedge* — ACF Lubricated Plug Valves.

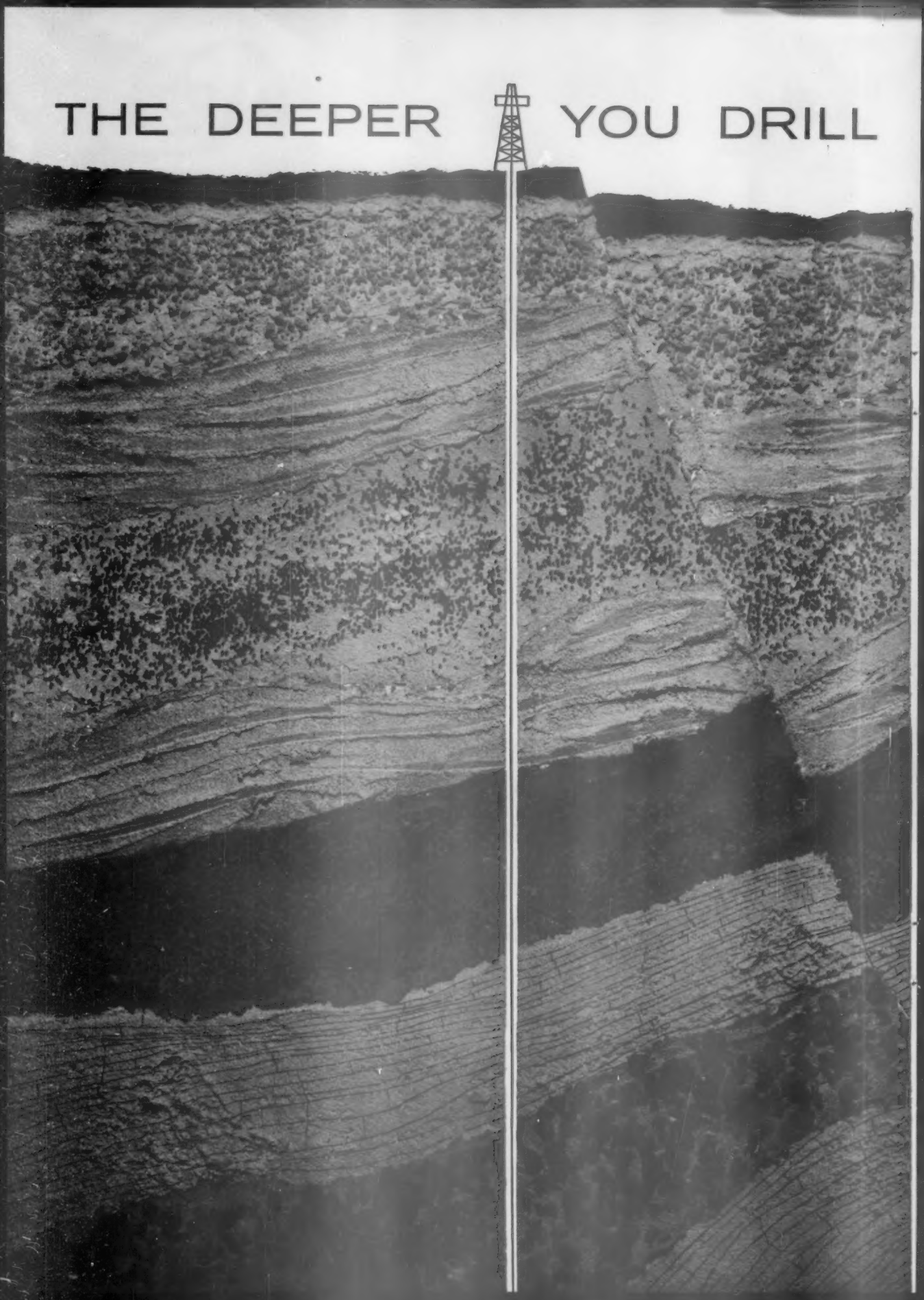
WRITE FOR CATALOG 400

Available in either full port or reduced port; rectangular, round, diamond and V-ports; also venturi, multiport and steam-jacketed models.
Materials: semi-steel, Ni-resist, bronze, aluminum
Sizes: ½" through 30"
Pressures: 125 through 800 psi.

W-K-M

DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

6007


THE DEEPER YOU DRILL

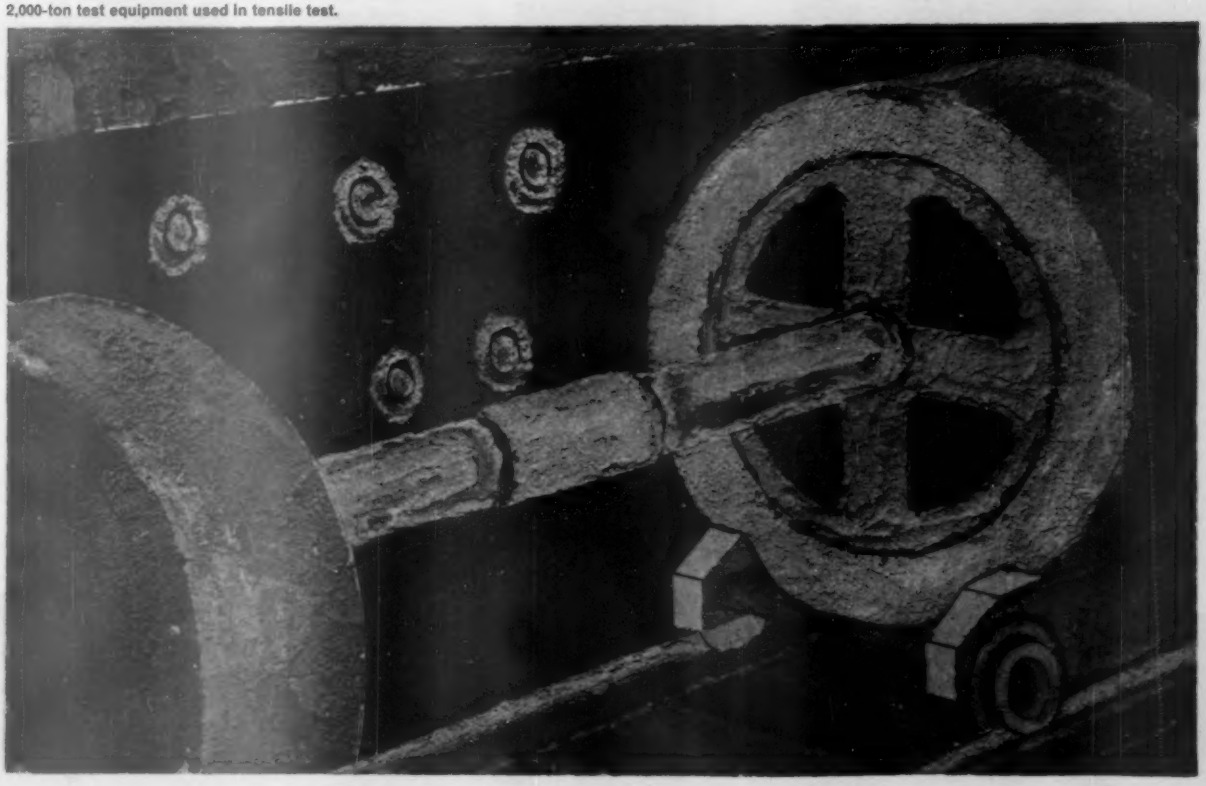
THE HARDER WE PULL

Ask a geologist how far you can drill a hole into the earth, and he might say, "Half-way . . . after that, you're drilling *out of*, not into."

The problem of hole depth is more than a riddle for oil men. They *have* to drill deeper and deeper every year, and their limit depends on the strength and durability of the tubular products they use.

At National Tube, drill pipe is tested under strain far in excess of anything encountered in the field. The type of equipment used can exert a 2,000-ton pull. So go ahead and drill deeper. National Tube is pulling for you.

2,000-ton test equipment used in tensile test.

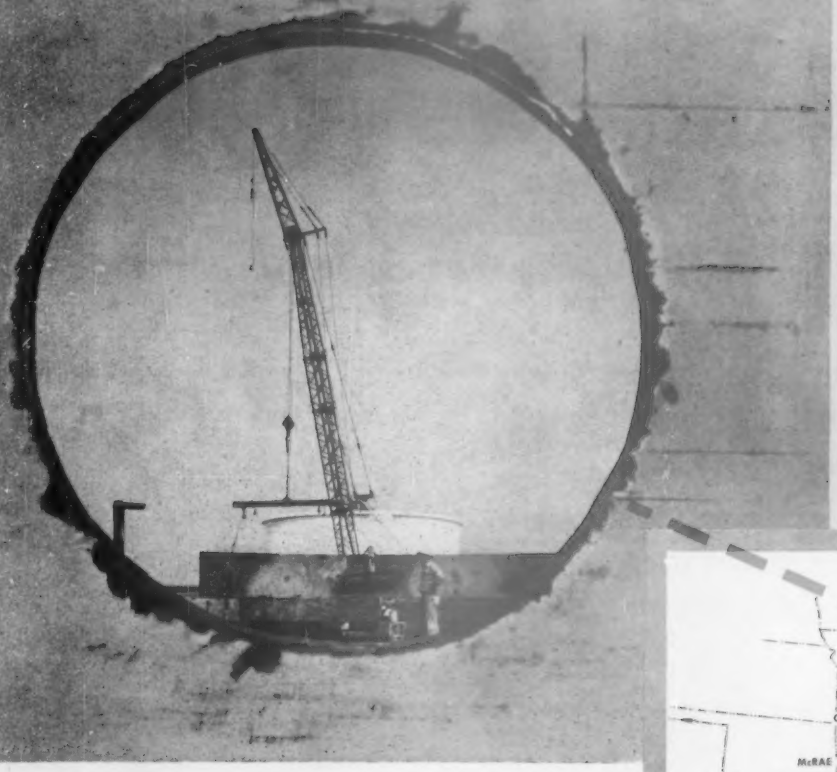


This mark tells you a product is made of modern, dependable Steel.

National Tube Division of United States Steel

Watch United States Steel's special Christmas show, **The Coming of Christ**, in Color on NBC-TV, Wednesday, December 21, 8:30 P.M., E.S.T.

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Export Company, New York



View of CB&I at work made through manway cutout in gasoline storage tank under construction for Texas Eastern at Seymour, Indiana.

P90CB

CB&I TANKS
serve
Little Big Inch System

After 11 years of natural gas transmission service, Texas Eastern's Little Big Inch pipeline is once more delivering refined petroleum products from Beaumont to the Midwest.

At key locations along the system, CB&I built more than 50 storage tanks during the reconversion of Little Big Inch. These facilities increased the system's storage capacity by more than 4 million barrels.

When *you* need storage tanks or process equipment, profit by learning more about CB&I's experienced and coordinated engineering, fabrication and erection services. Your inquiry is invited.

Cone roof storage tank above is one of more than 50 storage structures . . . including Horton Floating Roof tanks . . . built by CB&I along the Little Big Inch pipeline.

CHICAGO BRIDGE & IRON COMPANY

CBI

332 SOUTH MICHIGAN AVENUE
CHICAGO 4, ILLINOIS

OFFICES AND SUBSIDIARIES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

the OIL AND GAS JOURNAL

TULSA OFFICE
211 South Cheyenne Avenue
Box 1260
Phone LUther 4-4411

George H. Weber ..... Editor
Henry D. Ralph .. Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Farrar .... Engineering Editor
Frank J. Gardner .... Exploration Editor
Paul Reed ..... Pipeline Editor
W. L. Nelson ..... Technical Editor
Lynn M. Nichols .... Presentation Editor
John C. Casper ..... Economics Editor
W. B. Bleakley ..... Production Editor
Neil Williams ..... Associate Editor
Peter B. Bike ..... Geophysical Editor
H. S. Pylant, Petrochem. & Gas-Process. Editor
John P. O'Donnell .. Asst. Pipeline Editor
R. B. Tuttle ..... Equipment Editor
Jo Jeanne Speaker ..... Staff Artist

C. Dudley Johnston ..... Art Director
Robert B. Bizal ..... Editorial Research
John C. McCaslin ..... District Editor
W. A. Bachman ..... District Editor
Merle F. Blakely ..... District Editor
Sara Duncan ..... District Editor
Kenneth W. Brooks ..... District Editor
Norman K. Baxter ..... District Editor
Edward A. Martin ..... District Editor
Max L. Batcheldor .... Asst. Pres. Editor
Helen Brown ..... Editorial Assistant
Alice Burt ..... Editorial Assistant
Aileen Cantrell ..... Editorial Assistant
Margaret Higgs ..... Editorial Assistant
Marilyn Chance ..... Editorial Assistant

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910

D. H. Stormont ..... Refining Editor
Paul Swain ..... International Editor
Gene T. Kinney ..... East Coast Editor
Ray G. Gibson ..... District Editor

DALLAS OFFICE
1238 Mercantile Building
Phone Riverside 8-5701

Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone MAdison 2-0722

Carl J. Lawrence .... West Coast Editor

HOUSTON OFFICE
802 American Investors Building
Phone CApitol 4-7726

Ed McGhee ..... Drilling Editor
Howard M. Wilson ..... District Editor
H. C. Bozeman Gulf Coast Refining Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Clyde La Motte .... Washington Editor

BUSINESS STAFF

P. C. Lavinger ..... President

S. H. Rourke .. Executive Vice President
Mitchell Tucker . Vice Pres. and Adv. Mgr.
Kenneth B. Barnes .... Vice Pres., Eastern Hemisphere Operations
Hanson B. Pigman . Vice Pres., Circulation
L. John Ford ..... Mgr. Industry Census
J. Parker Holland .. Production Manager

ADVERTISING STAFF

TULSA OFFICE
211 South Cheyenne Avenue
Phone LUther 4-4411

John D. Reilly .. Mid-Continent Manager
Roy E. Finley ..... District Manager
Philip C. Lavinger, Jr. .... Representative
D. B. Miller ..... Classified Adv. Mgr.

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910

E. S. Klappenbach .... Eastern Manager
Harry B. Bullen ..... District Manager

PHILADELPHIA OFFICE
1509 Land Title Building
Broad and Chestnut Streets
LOcust 3-0118

John W. Meany, Jr. .... District Manager

PITTSBURGH OFFICE
Law & Finance Building, 429 Fourth Ave.
Room 1505, GRant 1-5847

Ernest S. Holzworth .... District Manager

DETROIT OFFICE
204 Washington Square Building
Royal Oak, Mich., LIncoln 7-9455

John D. Yoder ..... District Manager

LOS ANGELES OFFICE
650 South Grand Avenue, MAdison 2-0722

George O. Ruppert .... District Manager

CHICAGO OFFICE
105 West Madison Street
Phone CEntral 6-2537

David T. Kenney ..... District Manager
Karel Wegkamp ..... District Manager

HOUSTON OFFICE
802 American Investors Building
CApitol 4-7726

John M. Spears .... Gulf Coast Manager

DALLAS OFFICE
1238 Mercantile Building
Riverside 8-5701

Pren G. Hollingsworth .. District Manager

ENGLAND
67/68 Jermyn Street, St. James,
London S.W. 1. Phone TRAfalgar 6318

Max Holsinger .... Director International Sales Operations
A. T. Chapman-Purchas .. Group Manager

GERMANY
29 Hunsrücken Strasse,
Düsseldorf (Altstadt)
Phone 1-49-04

FRANCE
6, rue Franklin Roosevelt, Paris 8e
c/o Soc. D'Etudes Petrolieres, 3 Etage
Phone, MALzac 66-70

Subscription rates to the petroleum industry United States and foreign, 1 year, $5.00; 2 years, $8.00; 3 years, $10.00. Single copies $1.00. Back copies when over a year old, $2.00.

Member
Audit Bureau of Circulations
Associated Business Publications

They Say—

Over-sized acre

Dear Sir:

Since I have always placed the Big Yellow Book right alongside the Holy Writ for authenticity and accuracy, I was a little shook when I read:

"Floor of the new cavity covers 53,428 sq. ft., all within an area of less than a quarter acre." (OGJ, Nov. 14, p. 112 "Biggest LPG Cavern Finished").

I would be obliged if the author could locate me a few such acres, preferably over a nice, un-prorated oil field.

John A. Mann,
Area Superintendent
Cit-Con Oil Corp.
Lake Charles, La.

Editor's note: We should have said it is within an area of less than 1¼ acres and that surface facilities require less than ¼ acre.

A firm stand

Dear Sir:

I was delighted to read in the November 7 issue of The Oil and Gas Journal that three of the free-world's oil companies have made a stand against communist take-over of the oil market in India ("Cut-Rate Soviet Prices Met in India," p. 114).

Congratulations to Burmah - Shell, Standard - Vacuum, and Caltex for their action.

I pray that we all take a firm stand against communism both in the United States and abroad, even at the sacrifice of personal profit or socialistic benefits.

Gene M. Austin
Houston, Tex.

Jo Ann for luck

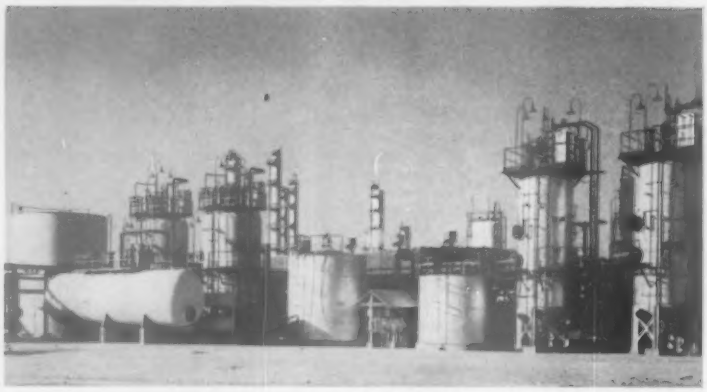
Dear Sir:

In the November 14 issue on page 218 you have reported that Frank Walsmith drilled a well on the Claude S. Barnes lease, Perry County, Pike Township, Ohio. This well was drilled by the writer of this letter, Raymond C. Walsmith, who also drilled the first well in this area as you reported in one of your May, 1960 issues (May 9, p. 253).

The first well on the Walsmith and Kinstle lease is known as 1 Jo Ann, and the well on the Claude S. Barnes is known as 2 Jo Ann. I am presently

PRODUCT IMPROVEMENT WITH **PETRECO**

Compact PETRECO Units help this refiner get better quality... AT LOWER COSTS



Six versatile Petreco treating units handle a wide variety of purification problems for the Richfield Oil Corporation refinery at Watson, California. This compact Petreco installation has a distillate capacity of 60,000 bpd and treats 19 streams, yet it occupies an area equal to only 50 x 100 feet of ground space. By using modern Petreco equipment, Richfield is able to supply increased demands for better gasoline, jet fuels, stove and diesel oils, and at the same time make substantial savings in time and money.

The purification equipment installed by Richfield during a three-year period—1955 to 1958—consists of five Petreco ELECTROFINING* Precipitators and a Bender Catalytic Sweetener. These units were selected to provide a complete flexibility:

A *Stove Oil-Jet Fuel Treater* replaced an older unit in order to meet more stringent specifications for jet juel.

A *Cycle Oil Treater* was in stalled to produce a stable product which can be used as a component of locomotive diesel fuel or No. 2 burner oil.

Two *Gasoline Treaters* were installed to remove hydrogen sulfide from straight run gasoline.

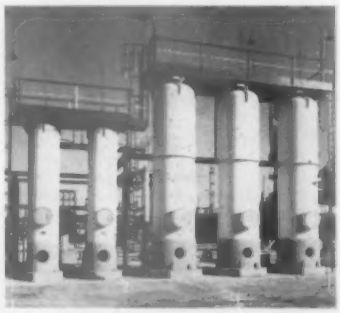
A *Diesel Oil Treater* was installed to give greater efficiency in removing naphthenic acids, and to stabilize the product.

A *Bender Treater* was installed to sweeten distillates from various sour crude stocks.

Bender sweetener vessels consist of two sulphur absorbers and three catalyst towers. Four of the ELECTROFINING units are two-stage treaters; one is single stage.

Richfield has realized these important advantages after installing Petreco treating equipment:

Saving in equipment costs. Continuous treating and "on-stream" blending have largely eliminated the need for intermediate storage vessels. A wide range of products is treated in a much smaller area than other treating equipment requires. *Savings in maintenance costs.* Thorough removal of spent caustic from straight run gasoline keeps exchangers and re-boilers in fractionating equipment operating with a minimum of fouling. *Savings in production costs.* Efficient treating reduces chemical consumption. Spent reagents are effectively removed from distillates. Product loss is low, because electrical separation leaves only a negligible amount of oil in spent reagents. *Savings in labor.* Automatic operation reduces labor requirements and gives more efficiency. *Safe, clean facilities.* All equipment is vapor-tight, for greater safety and cleanliness. There is no air pollution. *Improved product quality.* Treated products contain less sodium, naphthenic acid, mercaptans, sulphur, and color bodies. Storage qualities are greatly improved. Jet fuel passes all specifications without retreating.



Call on Petreco for sound suggestions for improving your refinery's treating facilities.

DT-60-1

PETROLITE CORPORATION

SUBSIDIARY AND AFFILIATED COMPANIES

CANADA, Edmonton, Alberta • ENGLAND, London
GERMANY, Frankfurt, a. M. • VENEZUELA, Caracas

PETRECO DIVISION

3202 South Wayside Drive (P.O. Box 2546), Houston 1, Texas
1390 East Burnett Street (P.O. Box 7216), Long Beach 7, California

REPRESENTATIVES

ARGENTINA, Buenos Aires • BRAZIL, Rio de Janeiro • COLOMBIA, Bogota
ITALY, Rome • JAPAN, Tokyo • KUWAIT, Kuwait • MEXICO, Mexico, D. F.
NETHERLANDS, The Hague • PERU, Talara • TRINIDAD, Port of Spain

Now*...measure levels of any liquid in any container with this hermetically sealed

"dripless dripstick"

From table oils to toxic chemicals, the FRI "dripless dripstick" can accurately measure the contents of any container. Throughout the petroleum and chemical industry, wherever liquid levels must be determined, this easy-to-read indicator can do the job faster, safer, and with absolutely no contact of the indicator rod with the liquid to be measured. *Fully Tested in Use

How does it work? A doughnut shaped magnetized float (A) surrounds a guide tube (B) and rides the level of the liquid. A calibrated rod with a magnetic tip (C) is pulled out until magnets (A) and (C) engage. Then, the liquid level is read at point (D) outside the container. Request specifications and prices on your letterhead.

Mounts Top or Bottom

Flight Refueling, Inc.

COMMERCIAL PRODUCTS SECTION
BOX 1701 • BALTIMORE 3, MD.

preparing to drill 3 Jo Ann about one quarter of a mile west of 1 Jo Ann.

I have named my wells in the Jo Ann series, after my daughter, for luck because I still think you need luck along with geology to locate good wells.

Raymond C. Walsmith
Columbus

A difference of opinion

Dear Sir:

Through the Journal we should like to commend Amalendu Roy for his article in the November 7 issue. His approach to the fact that "The Industry May Soon Need a New Approach to Geophysical Method of Finding Oil" (p. 208) is very practical and stimulating.

While our prime activity, radioactivity surveying, is only one of several methods covered by Mr. Roy, we feel that his type of thinking certainly serves as a shot in the arm for the industry.

Perhaps our philosophies are a little more conservative in that we contend radiation surveying is a most beneficial adjunct to present means of exploration. We do not advocate a complete, sudden change-over. The use of competent radiation surveys to define prospects worthy of further investigation by more expensive geophysical methods can materially improve the economics of petroleum exploration.

We feel that the Journal is doing the industry a great service by their concerted policy of publishing such timely and thought-provoking articles.

William D. Crews, President
Exploration Unlimited, Inc.
Tulsa

Dear Sir:

You're not doing the industry, the geophysical profession, or your magazine any good by printing such **junk!** (Roy article).

N. C. Steenland
Houston

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

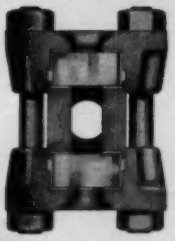
DECEMBER

- **4-7** American Institute of Chemical Engineers, meeting, Statler Hotel, Washington.
- **5-7** Interstate Oil Compact Commission, annual meeting, Westward Ho Hotel, Phoenix.
- **9** Tulane University, School of Law, and American Association of Oilwell

Strahman

HIGH PRESSURE GAUGES

USED IN REFINERIES AND CHEMICAL PLANTS THROUGHOUT THE WORLD



THRU VISION

REFLEX
Single or Multiple Sections

TUBULAR
Gauge Cocks
•
Large Chamber Reflex Gauges
•
Heated or Cooled Gauges

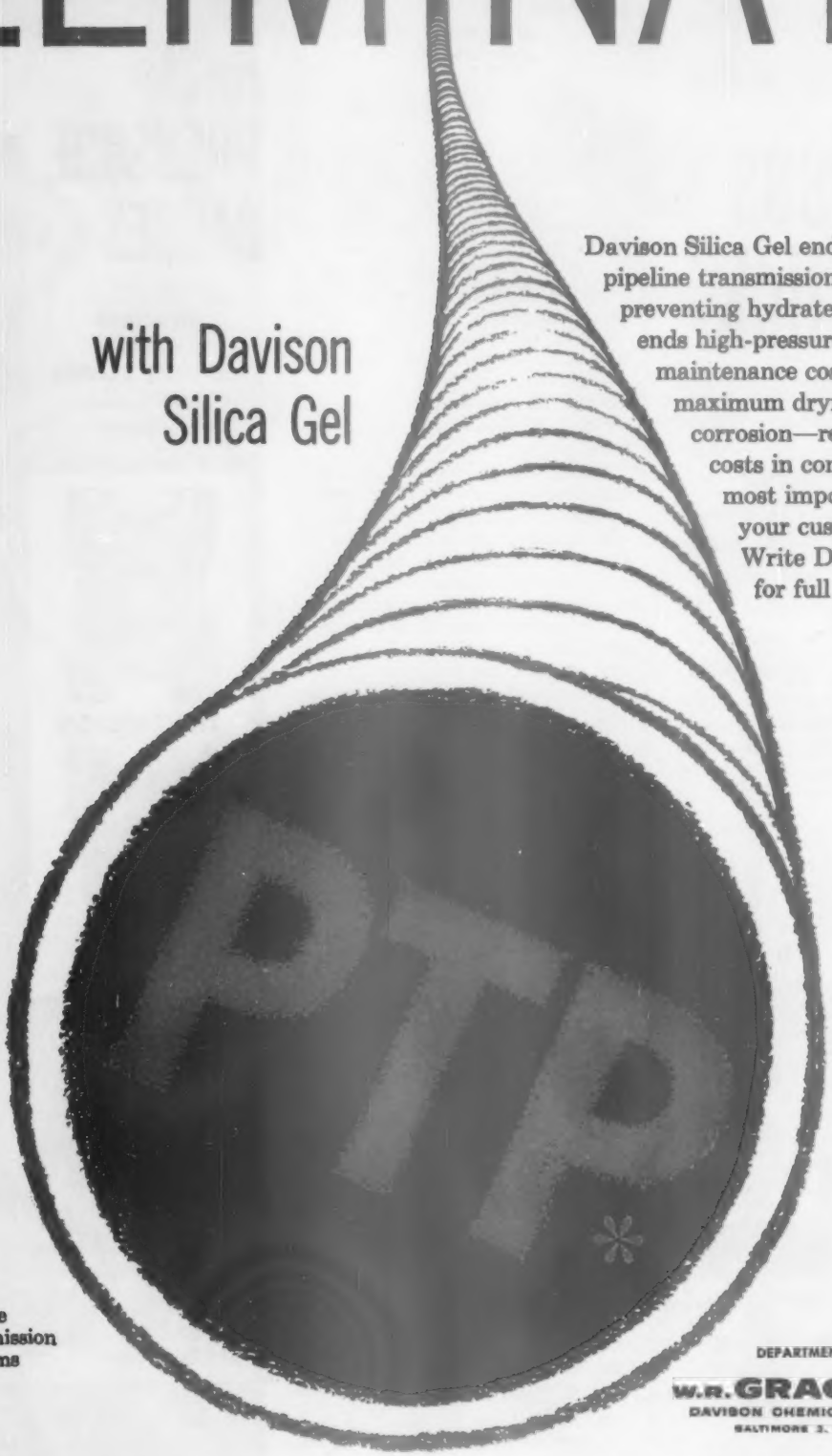
SEND FOR COMPLETE CATALOGUE

STRAHMAN VALVES, Inc.

ELIMINATE

with Davison Silica Gel

Davison Silica Gel ends natural gas pipeline transmission problems. By preventing hydrate formation, it ends high-pressure losses—lowers maintenance costs. By providing maximum dryness, it decreases corrosion—reduces power costs in compression—and, most important, keeps your customers happy. Write Dept. 3112 today for full information.



* Pipeline Transmission Problems

DEPARTMENT 3112

W.R. GRACE & CO.
DAVISON CHEMICAL DIVISION
BALTIMORE 3, MARYLAND

Drilling Contractors, fifth annual program on mineral and tidelands law, University Center, Tulane University, New Orleans.

26-31 American Association for the Advancement of Science, annual meeting, New York City.

JANUARY

15-18 Pipe Line Contractors Association, annual meeting, Mark Hopkins and Fairmont Hotels, San Francisco.

16-19 Instrument Society of America, winter instrument-automation conference and exhibit, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis.

17-19 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

18 Institution of Mechanical Engineers (Great Britain), symposium on pressure vessel research toward better design.

20 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

22-24 Kansas Oil Men's Association, annual convention, Broadview Hotel, Wichita.

24-27 Society of Plastics Engineers, seventeenth annual technical conference, Shoreham Hotel, Washington, D. C.

30-Feb. 9 University of Illinois, annual quality control short course, Urbana, Ill.

FEBRUARY

7-8 University of Oklahoma, School of Petroleum Engineering, advanced petroleum engineer seminar, University of Oklahoma, Norman.

8-10 Southwestern Legal Foundation, twelfth annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

14-15 National Association of Corrosion Engineers, Shreveport, La., section, short course, Centenary College, Shreveport.

15-16 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, Robert Driscoll Hotel, Corpus Christi.

18 Purdue University, business history conference, "Management Decisions Under Government Regulation," Memorial Union, Purdue University, Lafayette, Ind.

24 Natural Gasoline Association of America, South Louisiana regional meeting, Lafayette Petroleum Club, Lafayette, La.

26-Mar. 1 American Institute of Chemical Engineers, petrochemical and refining exposition, Municipal Auditorium, New Orleans.

26-Mar. 2 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Chase and Park Plaza Hotels, St. Louis.

MARCH

1 Institution of Mechanical Engineers (Great Britain), symposium on user experience of large-scale industrial vacuum plant, London.

3 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus.

7-8 University of Oklahoma, School of Geological Engineering, seventh biennial geological symposium, Student Union Building, University of Oklahoma, Norman.

8-10 American Petroleum Institute, Division of Production, southern district meeting, Captain Shreve and Washington-Youree hotels, Shreveport, La.

13-16 Kentucky Petroleum Marketers As-

Short, compact, less to drill up

Type BC Otis Wire Line Bridge Plug

Small O.D. offers ease of running.

Can be set with any pressure setting tool.

The Type BC Otis Wire Line Bridge Plug is designed to take the guesswork out of plugging, yet it costs you no more than an ordinary plug. It's short and compact — less to drill up — and has an unusually small O.D. for ease of running. The Type BC has been successfully run on many occasions where other plugs failed to get down. And a feature you will particularly like is that the Type BC Otis Bridge Plug covers a wider range of casing weights than any other plug available today. This feature alone has saved many times the cost of a plug where accurate casing weight records were not available.

AVAILABLE FROM ALL ELECTRIC LINE SERVICE COMPANIES — STOCKED AT 247 FIELD LOCATIONS. Not only are Otis Wire Line Bridge Plugs available through any electric line service company, but stocks are maintained at 247 different field storage locations so that you can set an Otis plug whenever you need it — wherever you need it. And Otis bridge plugs can be set on any type of pressure setting tool. So the next time you need a bridge plug to prevent movement of fluid or gas from either direction in the casing, or to plug and abandon — play safe — specify an Otis Wire Line Bridge Plug.

©1960 O.E.

OTIS ENGINEERING CORPORATION

General Offices: 6512 Denton Drive, Dallas

Branches Throughout the Oil Country

Economy never came in such a choice!

NEW FORD TRUCKS

FOR 1961

619 NEW MODELS! All engineered with one idea in mind . . . economy! New "Big Six" engine for 2-tonners plus five Cummins diesels for the new H-Series tractors expand the proven line of Ford engines to 18—with one just right for your job. A wider-than-ever choice of transmissions and axles. And . . . on all 1961 Ford Trucks, each part, except tires and tubes, is now warranted by your dealer against defects in material and workmanship for 12 months or 12,000 miles, whichever occurs first. The warranty does not apply, of course, to normal maintenance service or to the replacement in normal maintenance of parts such as filters, spark plugs and ignition points.

FORD TRUCKS COST LESS

YOUR FORD DEALER'S "CERTIFIED ECONOMY BOOK" PROVES IT FOR SURE!

New! Durable Tandems

Ford's Tandem Axle trucks for '61 are engineered to give you greater flexibility and significant payload advancements. Your choice of 22,000-lb., 28,000-lb., 30,000-lb., 34,000-lb., or 38,000-lb. axle capacity. New, longer wheelbases are available to permit installation of special bodies up to 21 feet long. Aluminum walking beams as well as aluminum wheels and gas tanks are optional for reduced chassis weights.

FORD DIVISION, Ford Motor Company

New!
Space-Saving Tilts

Ford's popular Tilt Cab Series outsells all the other makes and for good reason! Compact 82-inch BBC permits longer bodies for a given over-all length, and wide-track front axle makes it more maneuverable for congested area work. Ford offers the lowest-priced* tilt-cab model in the industry! And for '61, the bigger Ford Tilts are available with a lightweight, fiberglass sleeper cab compartment that adds only 2½ inches to the standard BBC dimension.

*Based on a comparison of latest available manufacturers' suggested retail delivered prices

New! H-Series Diesel- or Gas-Powered Tractors

Ford's new H-Series tractors with 28-inch front axle setting and 82-inch BBC are offered in four single-axle and four tandem-axle models with over 500 engine-axle-transmission combinations. Choose from ten industry-accepted engines—five Cummins diesels and five Ford Super Duty V-8's!

New 100,000-mile warranty on Super Duty V-8 gas engines is most liberal in the industry. On 401-, 477- and 534-cu. in. V-8's, Ford Dealers will replace any major engine part (including block, heads, crankshaft, bearings, valves, pistons, rings) found to be defective in materials and workmanship in normal on-highway use. Warranty covers full cost of replacement parts for 100,000 miles or 24 months, whichever occurs first . . . full labor costs for first year or 50,000 miles, sliding percentage scale thereafter.

HEAVY TRUCK GENUINE PARTS Ford SERVICE DIESEL

NATIONWIDE SERVICE . . . *look for this sign at Ford Dealers' across the country, for service on all Ford gas and diesel trucks!*

New! "Big Six" Engine

More power for America's savingest 2-tonners . . . a big 262-cu. in. Six with the performance of big displacement, the durability of heavy-duty construction, plus the gas economy of 6-cylinder design! Available early 1961. You also get improved riding comfort with new smoother-acting springs and a sturdy truck suspension system that can give up to twice the front tire life of some other makes.

New! 4-Wheel Drive Pickups

Ford offers the lowest-priced* 4 x 4 with big 8-ft. box. And these models have the getup and traction to go most anywhere . . . road or no road! You can choose from two modern engines—the gas-saving 135-hp Six or the 160-hp V-8 that gives extra power and smoothness with "six-like" economy.

BONDSTRAND®

An imaginative solution to your piping problems

From Missile Research...
A new product for process piping

- Twice as strong as steel
- 1/4 the weight of steel
- Inherently resistant to chemicals which attack stainless steel

Bondstrand is a corrosion-resistant, high strength, rigid pipe made of glass filaments bonded in chemically inert synthetic resins. It is capable of withstanding high pressure and the corrosive attack of many salt, acid, and alkaline solutions. The outside surface is equally resistant because the pipe is made entirely of corrosion-proof materials. No painting or maintenance is necessary.

Bondstrand's light weight and ease of assembly can save up to 50% of installation costs. Actual cost records of typical applications prove that the total installed cost averaged only 1.3 times that of carbon steel pipe. By eliminating the corrosion problem and down time for replacement or repair, Bondstrand saves many times its slightly higher initial cost.

Bondstrand is now available in sizes from 2" through 8" with all necessary couplings and fittings. Larger sizes available on special order.

Write for bulletin containing complete data, including physical properties, chemical resistance, flow rates, and other design information.

Amercoat® CORPORATION 126

A Subsidiary of American Pipe and Construction Co.

Dept. CI, 4809 Firestone Blvd., South Gate, California

921 Pitner Ave. Evanston, Ill. | **360 Carnegie Ave. Kenilworth, N. J.** | **111 Colgate Buffalo, N.Y.** | **2404 Dennis St. Jacksonville, Fla.** | **6530 Supply Row Houston, Tex.**

association, sixth management institute, conducted by the University of Louisville, Brown Hotel, Louisville.

13-17 National Association of Corrosion Engineers, annual meeting and corrosion show, Hotel Statler, Buffalo, N. Y.

15-17 Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas.

21-23 American Power Conference, twenty-third meeting, Sherman Hotel, Chicago.

22-24 American Petroleum Institute, Division of Production, southwestern district meeting, Cole Hotel, Albuquerque.

23 National Industrial Conference Board, general session, Shamrock-Hilton Hotel, Houston.

27-29 Midwest Gas Association, annual meeting and convention, Sheraton-Fontenelle Hotel, Omaha.

27-31 Instrument Society of America, symposium on temperature measurement and control in science and industry, Veterans Memorial Auditorium, Columbus, Ohio.

28-29 University of Oklahoma, Schools of Petroleum and Gas Engineering, gas conditioning short course, Oklahoma Memorial Union Building, University of Oklahoma, Norman.

APRIL

4-5 University of Kansas, gas compressor institute, Liberal, Kans.

5-7 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Mayo Hotel, Tulsa.

6-7 University of Oklahoma, School of Mechanical Engineering, short course on industrial engines, University of Oklahoma, Norman.

9-12 Western Petroleum Refiners Association, annual meeting, San Antonio, Tex.

9-13 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Jung Hotel, New Orleans.

10-11 American Society of Mechanical Engineers, maintenance and plant engineering conference, Bancroft Hotel, Worcester, Mass.

11-13 Petroleum Industry Electrical Association and Petroleum Electrical Supply Association, annual conference, Moody Convention Center, Galveston, Tex.

17-19 Instrument Society of America, symposium on instrumental methods of analysis, Shamrock-Hilton Hotel, Houston.

18-20 University of Oklahoma, southwestern gas measurement short course, North Campus, University of Oklahoma, Norman.

19-21 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

20-21 Society of Petroleum Engineers of AIME, East Texas-Louisiana-Arkansas gas-technology symposium, Tyler, Tex.

24-26 Southern Gas Association, meeting, New Orleans.

24-27 American Association of Petroleum Geologists, Society of Economic Paleontologists, and Rocky Mountain section of AAPG, annual meeting, Denver Hilton Hotel, Denver.

26-28 American Petroleum Institute, Division of Transportation, pipeline conference, Chase-Park Plaza Hotel, St. Louis.

27-28 Rocky Mountain Oil and Gas Association, midyear meeting, Northern Hotel, Billings, Mont.

28 Natural Gasoline Association of

NO LEAKAGE...

You're looking at the newest thing in valves . . .

STOCKHAM'S NEW WEDGEPLUG* "O-SEAL" VALVE

Two Teflon** "O" rings in the plug give constant vapor-tight shut-off . . . to give you double assurance of double savings on operating and maintenance costs.

NO LUBRICATION! . . .

HOW TEFLON "O" RINGS WORK The two Teflon "O" rings are inserted in dovetail grooves machined on the face of the plug. These "O" rings seat on the raised body seats when the plug is in closed position.

CONSTANT VAPOR-TIGHT SHUT-OFF This sealing effect of the "O" rings gives absolute shut-off in all cases—shut-off that remains permanently "bubble tight." The Teflon "O" rings are chemically inert, practically frictionless, and will not cold flow.

TESTS PROVE POSITIVE SHUT-OFF

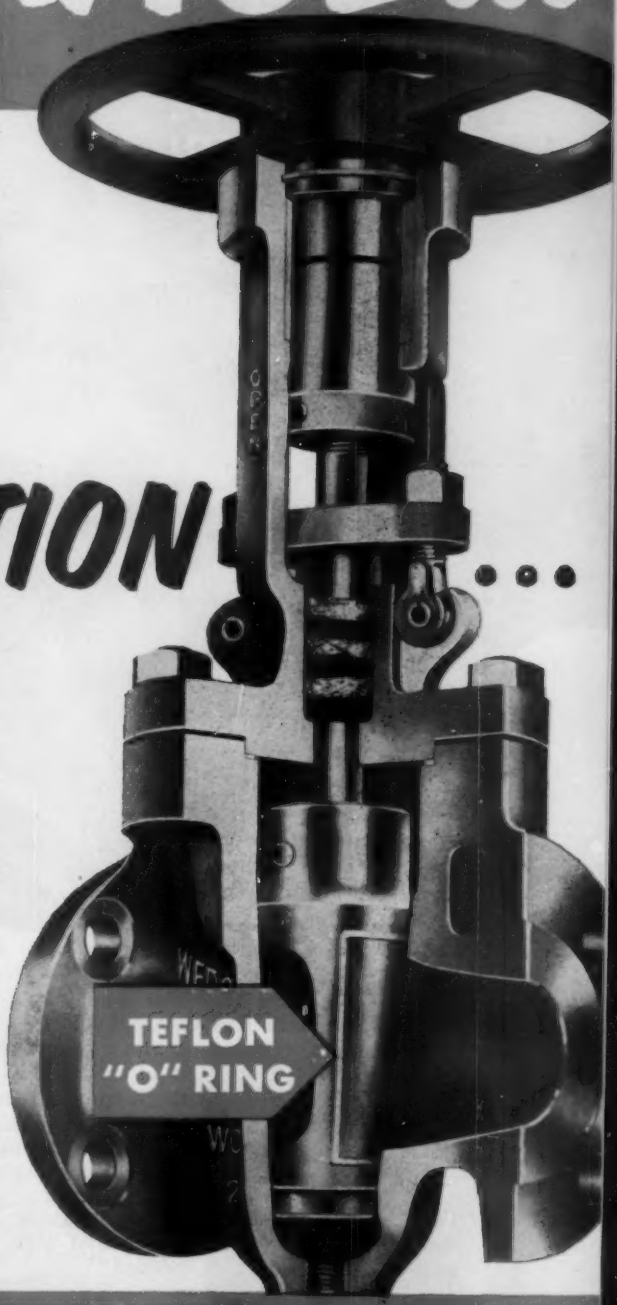
Hundreds of tests of this new valve in all types of services have failed to make it leak. Performance has been remarkable. In every case, the valve held "bubble tight" because of the pressure seal effect of the "O" rings.

OTHER OUTSTANDING ADVANTAGES

Non-Lubricated—no costly maintenance necessary • Provides Double-Block and Bleed in most services • Quick, Easy Operation—won't stick or bind • Double Seating for Double Safety—Ground metal-to-metal seat provides shut-off in case fire burns out "O" rings • No Product Contamination • Protected Seats

RECOMMENDED USAGES Stockham's new "O-Seal" is recommended for all general purposes—air, gas, water, steam, propane, hydrocarbons, etc., as well as for hard-to-hold services. Recommended for temperatures from minus 300°F to 400°F and not exceeding 720 psi.

Available in carbon and alloy steels, 2" - 12" sizes, 150 and 300 lb. pressures. Three port openings—40%, 70%, full round-wrench, handwheel, gear, and motor operated.



* Patented
** Teflon DuPont Trademark

STOCKHAM'S NEW WEDGEPLUG "O-SEAL" VALVE

Call Your STOCKHAM Distributor or Sales Representative for complete details, or write today for the new brochure on the Wedgeplug "O-Seal."

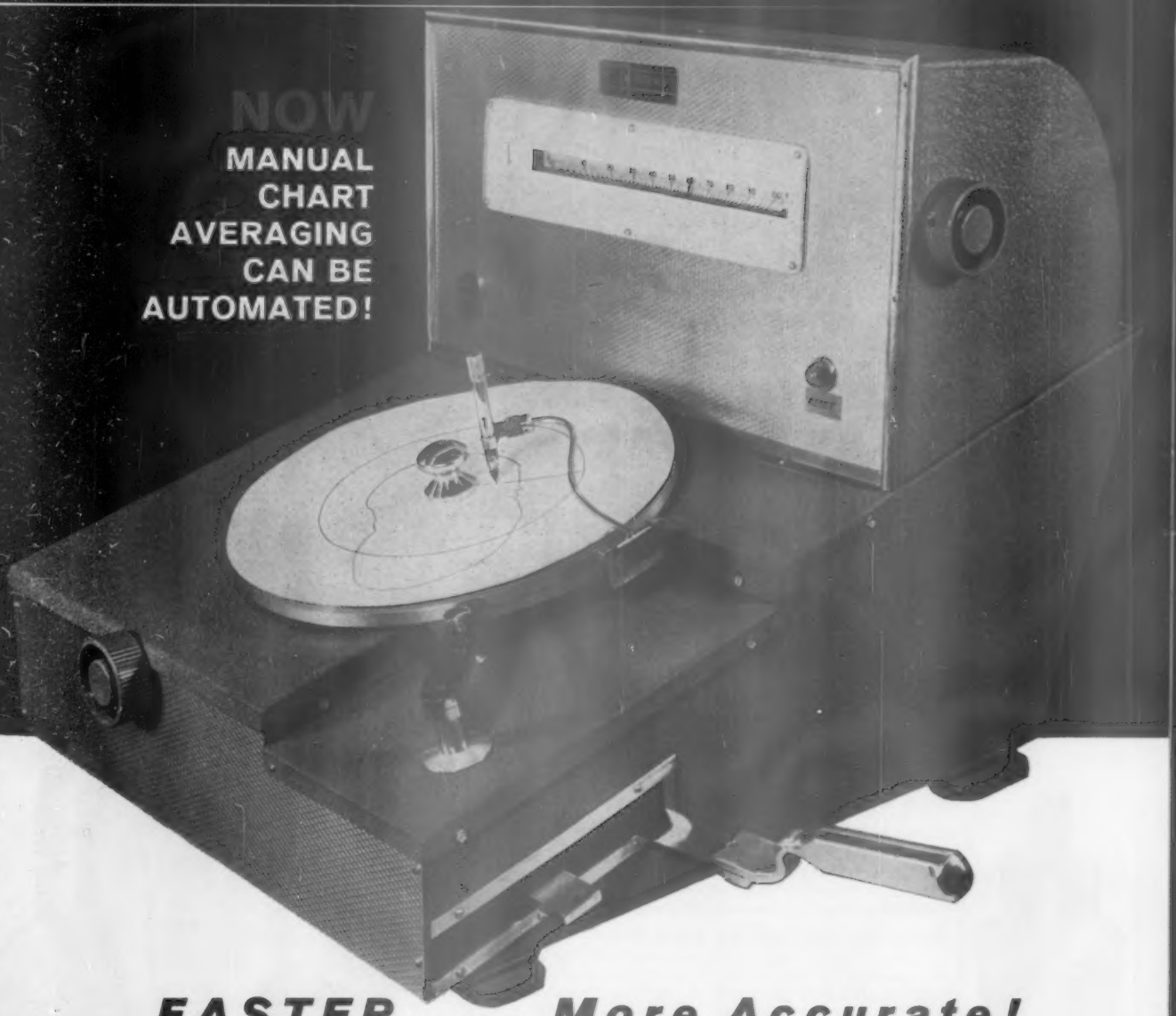
Stockham makes a **BETTER** *valve...for* **EVERY** *job!*

WEDGEPLUG VALVE COMPANY Division of →

STOCKHAM VALVES *and* **FITTINGS**

General Offices and Plant — 4002 North 10th Avenue, Birmingham 2, Alabama

CAST IRON-MALLEABLE PIPE FITTINGS • BRONZE, CAST IRON, DUCTILE IRON, CAST AND FORGED STEEL VALVES



FASTER . . . More Accurate!

The UGC CHART AVERAGER continuously averages temperature, gravity or pressure charts. ONE OPERATOR in ONE OPERATION handles the job without comptometers, adding machines or the need for checking. No special operating skill is required other than a short period of instruction.

TIME SAVING—Typical time saving *per chart* is three minutes as compared with the time-consuming manual method.

ACCURACY—During a period of two months, more than 2,300 charts were manually calculated and AVERAGER figured. In every case the Averager produced correct averages as previously determined in the slower manual procedure.

RELIABILITY—In 2½ years of research and testing, and with more than a year's actual operation in the United Gas chart offices, the all-mechanical AVERAGER system has been performance-proved for minimum repairs and maintenance.

MODELS AVAILABLE— Averagers are available for practically any circular chart—temperature, pressure, specific gravity, flow-rate or other process variables.

Strip chart models are available on special order.

For further information write or phone:
UGC INSTRUMENTS
P. O. Box 1407
Shreveport, Louisiana
Phone UN 1-4531—LD81

UGC
A DIVISION OF UNITED GAS CORP.
INSTRUMENTS
CHART AVERAGER

America, Oklahoma regional meeting, Lake Murray Lodge, Ardmore, Okla.

30-May 2 Independent Petroleum Association of America, midyear meeting, Roosevelt Hotel, New Orleans.

30-May 3 Liquefied Petroleum Gas Association, convention and trade show, Conrad Hilton Hotel, Chicago.

MAY

3-5 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone-Henning Hotel, Casper, Wyo.

4-5 Society of Petroleum Engineers of AIME, oil recovery conference, Midland, Tex.

4-5 Pacific Coast Gas Association, Inc., transmission conference, Biltmore Hotel, Santa Barbara, Calif.

7-10 American Institute of Chemical Engineers, meeting, Sheraton-Cleveland Hotel, Cleveland.

8-11 American Petroleum Institute, Division of Refining, midyear meeting, Rice Hotel, Houston.

9-11 Western Joint Computer Conference and Exhibit, Ambassador Hotel, Los Angeles.

10-12 American Society of Mechanical Engineers, production engineering conference, Royal York Hotel, Toronto.

11-12 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

14-16 Texas Independent Producers and Royalty Owners Association, Scharbauer Hotel, Midland, Tex.

16-19 American Petroleum Institute, Division of Marketing, midyear meeting, Americana Hotel, Miami Beach.

19 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

21-24 American Petroleum Institute, Division of Transportation, midyear highway conference, Bellevue Stratford Hotel, Philadelphia.

23-24 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Hotel Lassen, Wichita.

25-26 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual Rocky Mountain petroleum sections, joint meeting, Salt Lake City.

JUNE

5-8 Instrument Society of America, summer instrument-automation conference and exhibit, Royal York Hotel and Queen Elizabeth Hall, Toronto.

9-17 European Congress of Chemical Engineering and Achema Congress, thirteenth exhibition and congress of chemical engineering, Frankfurt am Main, Germany.

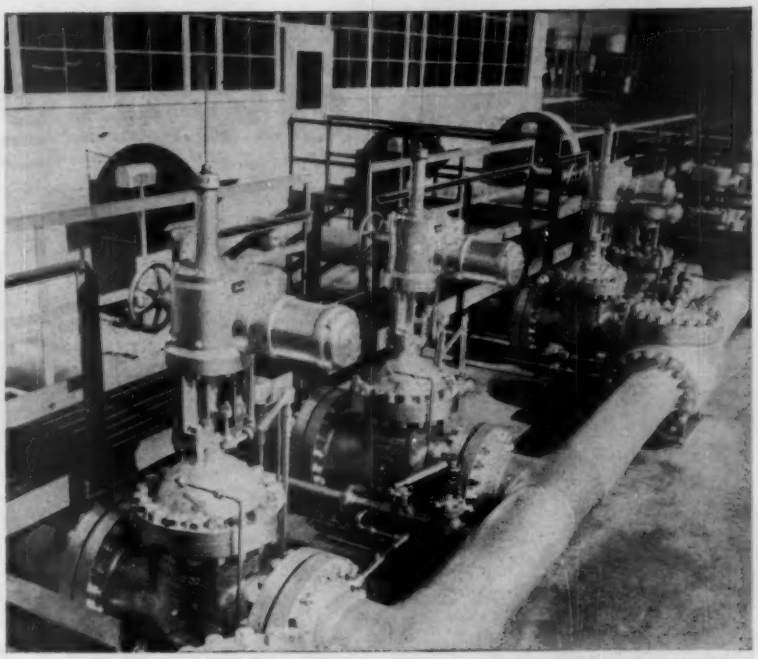
11-15 American Society of Mechanical Engineers, summer annual meeting, Statler Hilton Hotel, Los Angeles.

12-14 American Petroleum Institute, Division of Transportation, annual tanker conference, Oyster Harbors, Cape Cod, Mass.

13-16 Instrument Society of America, biennial international gas chromatography symposium, Kellogg Center, Michigan State University, East Lansing, Mich.

19-21 Interstate Oil Compact Commission, midyear meeting, Shamrock-Hilton Hotel, Houston.

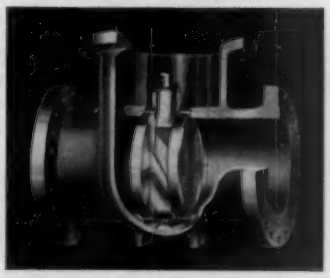
25-30 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.



Why DARLING revolving double disc gate valves mean...

PERMANENT GOOD BEHAVIOR

The reason is very simple. These valves are different! They were designed with one objective uppermost—to be unaffected by the very conditions that lead to trouble in ordinary gate valves. And so it was that Darling came up with the fully revolving double disc, parallel seat principle. It minimizes friction and avoids wear concentration. It assures remarkably easy operation with self adjustment for positive closure. It automatically compensates for any valve body deflection.



The proved result is that these Darling valves consistently show superiority in service life, low maintenance, positive operation and trouble-free performance. Savings naturally result. Write for Catalog No. 57.

DARLING VALVES

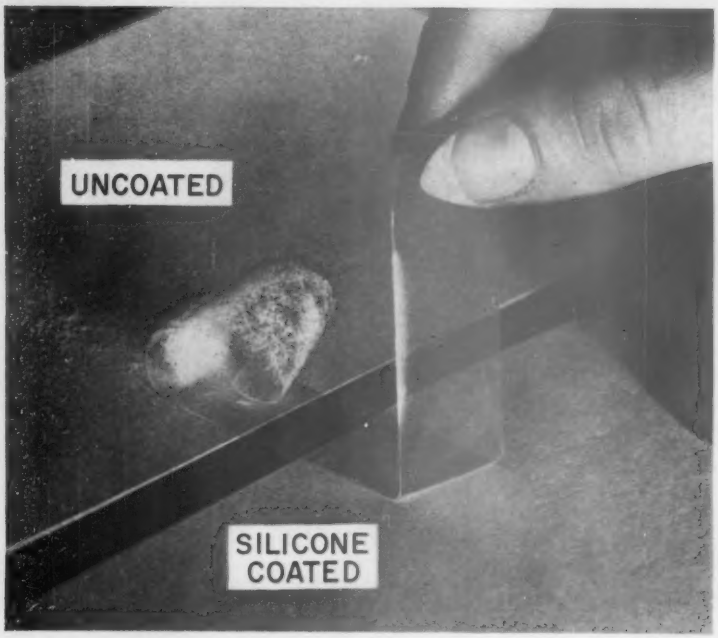
DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

SILICONE NEWS from Dow Corning

No Sticking Here!



New Silicone Coatings for Paper End Sticking; Save Time, Money

Sticky products like asphalt, dates, and uncured rubber have always been troublesome to pack, unpack or process. But that's all in the past for people who specify new Syl-off® silicone coatings for paper.

Even the stickiest materials are easily and cleanly removed from shipping containers made with Syl-off coated paper or paperboard. And there's nothing to compare with the ease of removing Syl-off coated separators from pressure-sensitive backed items — labels, decals, wallpaper . . . backing papers peel completely free without tearing. Syl-off coatings won't transfer or migrate, either . . . which means you can use coated papers as package wraps, liners and interleaving for food products.

WHO BENEFITS? You do! If you buy and use sticky materials, Syl-off means faster in-plant handling and processing. You get all the material you pay for and product losses are minimized. If you ship sticky products, Syl-off helps you create the kind of happy, satisfied customers who make the difference between profit and loss. You can actually save money, too, because Syl-off brand coatings weigh less than other release coatings which means lower shipping costs.

GETTING PERSONAL. Are sticky products giving you or your customers trouble? Can Syl-off help? Syl-off coated papers or containers can be engineered to your special needs by experienced mills and converters. Write now for list of Approved Sources. Address Dept. 6212.

Now Available: New Brochure—
"How Silicones Serve the CPI"
Write Dept. 6212.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

the Journal said...

50 years ago

December 8, 1910

A railroad operating a 17-mile tap line between Bloomburg, La., and Atlanta, Tex., tries out the use of natural gas as a fuel for firing a locomotive by converting the locomotive's tender into a high-pressure gas container. The tender was charged with gas from a tap on a convenient gas line. The tender held enough gas for the round trip between the two cities, but it was found that switching requirements on the trip overreached the capacity.

Shallow oil showings encountered in an artesian water well being drilled at Bluejacket, 12 miles north of Vinita, in Craig County, northeastern Oklahoma, precipitates a rushing influx of lease traders and prospectors to the area, where a new oil play appears in the making. Showings were at a 550-ft. depth.

25 years ago

December 5, 1935

Pithole, phantom oil-boom town of 70 years ago, stages comeback on oil map as modern drilling and production practices take over at this famous and historic Pennsylvania site. Four new repressuring plants, boosting the total number to eight, enliven the area, where 16 strings of drilling tools are running.

Tightening of conservation enforcement in giant East Texas field cuts "hot" oil production to record low level of between 13,500 and 16,500 bbl. daily.

Continental Oil Co. innovates use of rotary tools in drilling carbon dioxide gas wells in its prolific new Waldron field, in Jackson County, northern Colorado.

10 years ago

December 7, 1950

Texas Eastern Transmission Corp. reveals plans for 805-mile natural-gas pipeline from Mississippi to Pennsylvania. The system will supply 176,000 M.c.f. of gas daily to Texas Eastern's eastern outlets, and to Algonquin Gas Transmission Co. for New England distribution.

Gulf Refining Co. builds first submersible tank-battery barge for marine operation. Initial unit will operate in Black Bay field, 50 miles southeast of New Orleans, in Plaquemines Parish. Location will be 1 mile offshore in 7 to 8 ft. of water.

First shipments of crude oil through the new Trans-Arabian pipeline system are loaded from terminal at Sidon, Lebanon. Four tankers take aboard 700,000 bbl. of oil pumped 1,068 miles from Saudi Arabian fields.

JOURNALLY SPEAKING

We don't like to brag, but . . .

BOB BIZAL, director of editorial research, erupted into the office, waving a gilded scroll.

"Look at this. An award of merit from the Industrial Marketing editorial contest."

I looked up. "How did you get it?"

Bob shook his head. "Not me. The Journal. It's an award of merit for The Oil and Gas Journal. For outstanding editorial achievement."

I shrugged. "Natch. We never put out anything but outstanding-editorial-achievement stuff."

He cocked an eyebrow. "Never?"

I shifted in my chair uneasily. "Well, almost never. What's so hot about this particular award?"

He pointed to the printing on the scroll: "For outstanding single article published during the period ending June 30, 1960."

I scratched my head. "I don't remember writing any such article."

Bob stared at me. "It wasn't you. It was a special report on the oil-depletion allowance. George Weber wrote it, with help from John Casper and a lot of others."

I mused, "Oh. Well, I must have done a pretty outstanding job on presentation."

Bob cleared his throat. "Actually, Lynn Nichols handled the presentation work and Dud Johnston did the art work."

I shuffled the papers around on my desk. Pretty soon I said, "Not much competition for the award, I suppose?"

Bob said, "Hundreds and hundreds of editorial entries were made in this contest. The competition was fierce."

"Well," I said, "our first time at winning an award—."

Bob retrieved the scroll and placed it carefully back between two pieces of cardboard. "First award, my eye. We've won 17 awards so far in one contest or another—all for editorial achievement."

"Okay," I said, suddenly eager to get back to my work.

Bob wasn't to be put off. "These awards don't grow on trees, you know. You've got to earn them."

I sharpened a pencil.

Bob said, "Editorial quality in a magazine comes from experience and specialization. The Journal has more than 40 editors, and they know petroleum inside out, upside down, and six ways from breakfast. You name it — exploration, drilling, production, field processing, refining, marketing—whatever it is, we've got an editor who's right on top of it."

I opened and closed several drawers in a marked manner. "You convinced me," I said.

Bob went on. "It'd be a whopping big job just to produce a magazine as big as the Journal each week. Our editors not only do it, but do it well enough to win awards for outstanding merit."

Suddenly I scribbled something on a sheet of paper, and said to Bob, "Can I quote you on that?"

Bob paused. "Quote me where?"

I scribbled some more. "I thought I might write a piece for Journally Speaking about it."

Bob shook his head. "Oh, we can't print a bunch of stuff like that. It wouldn't look at all modest, carrying on about ourselves that way. No, we'll just have a dignified little announcement on page 75, so our readers will be aware that we **did** win an award."

I laid the pencil down. "Suit yourself. Seems like good material to me."

"No," Bob said, backing out of the office. "No, it wouldn't do for Journally Speaking at all. Too ostentatious." He patted the scroll lovingly. "Well, I'm going to get this framed. So long."

I still think somebody could do something with it for Journally Speaking.

—Max L. Batchelder

MOST RESPECTED PACKER

It's known the world over for sheer downright dependability

BAKER RETAINER
PRODUCTION PACKER
PRODUCT 415-D

THE DOUBTS that harass well operators got a real body blow when the now-celebrated Baker Retainer Production Packer was developed some years ago.

This is probably the most predictable (and certainly the most respected) packer ever to go into an oil well. It commands the respect and confidence of operators the world over.

WHAT'S THE SECRET of building a packer so tough and reliable you know it will keep you honest when you recommend it?

For one thing, it takes time—years of performance studies. We've sweated out failures and assessed our successes—sifted out weak points and strengthened the strong points.

This great packer is at work right now in tens of thousands of wells—the average wells, the corrosive wells, the deep, hot, high pressure wells.

THAT'S A TOUGH proving ground—one that has helped us soak up a vast knowledge of what happens to slips, packing elements, and the like, when a packer is downhole. We've got the facts.

Baker made the first retainer packer—for many years the *only* retainer-type packer. The result is a wealth of packer experience that's hard to equal.

This remarkable packer shows it. Over the years we've refined it into a tool that has unyielding stamina. That's why we can call it the most predictable packer of them all.

This great packer has many applications—it's as versatile as it is dependable. It's a single-string production packer that comes in many sizes and bores. Moreover, it is surrounded by a family of accessories that transform it into a dual or triple packer—or into a temporary or permanent bridge plug or squeeze tool. Its formidable pressure-holding capacity makes it in many ways one of the finest of all squeeze packers.

It is set on a wire line—or on tubing or drill pipe. Baker's fast new milling tool mills one out in two to four hours—a fourth the time it once took.

For the latest practical knowledge of how to use Baker Retainer Production Packers, call your Baker Representative.

BAKER

RETAINER PRODUCTION PACKER

BAKER OIL TOOLS, INC. HOUSTON / LOS ANGELES / NEW YORK

Key to better times: "Market awareness"

INDEPENDENT PRODUCERS in Kansas have formed a special committee to study retail marketing in their area.

They have no financial interest in any service station or refinery, nor do they contemplate entering these phases of the business. For years they took pride in not wanting to know anything at all about marketing.

Now they are actively studying the causes and effects of gasoline price wars and doing whatever they can to stabilize retail prices—even to the extent of personally berating the operators of cut-price stations.

THIS IS A SIGN of the times. It is one example of a growing "market awareness"—a condition which leaders and critics of the industry have been preaching for a long time.

Those Kansas producers have realized that the only money the industry gets for exploration, drilling, or anything else comes from the retail market, and if retailing is sick the whole industry is in pain. They were jarred into action by the pronouncements of some refiners that the price of crude should go up or down with the price of gasoline.

A similar market awareness is becoming evident in some other groups of producers and some state commissions. They are closely studying demand trends and attempting to adjust crude supply to match. Only a few are still trying to force refiners to buy more crude than they ask for.

Probably for the first time in history producers are concerning themselves with national and local refinery runs, stock figures, products prices, market patterns, and the profit margins of refiners and distributors. It is beginning to dawn that oil really is an integrated industry.

Not only producers have lacked market awareness. Refiners and marketers are beginning to admit some blind spots of their own. They are now examining motorists' habits and preferences, dealers' attitudes and practices, and their own distribution methods and sales policies.

Oil heating is another example. Instead of just making good heating oil available, the industry is now consolidating its market study and promotion programs, and is doing research to develop more efficient and satisfying consumer equipment.

MARKET AWARENESS includes finding out what customers really want instead of what somebody thinks they ought to want. It also includes knowing how a seller is affected by what subsequent resellers do, and what happens to a product in every link of the distribution chain.

During generations of rapid growth in demand, the oil industry in general had a rather cavalier attitude toward its markets—the attitude that oil sells itself. This, perforce, is changing.

Awareness that the whole industry's health depends on the condition of its marketing activities is the first step in improving the profit possibilities for all. Market awareness may be the key to a more prosperous 1961.

High stresses, harsh corrosives—nickel steel rods handle both!

When pumping deep wells, at extreme loads, nickel alloy steel sucker rods prove—time and time again—that they have the strength and toughness needed to withstand high stresses, fatigue, and great shock loads.

When pumping corrosive wells, these same nickel steel rods also withstand the corrosive attacks of sour crude, sweet oils, hydrogen sulfide, brines, and acids.

And in wells where high mechanical stresses combine with extreme corrosive conditions—nickel alloy steel sucker rods demonstrate that they resist this double threat and deliver record-breaking performance!

Nickel alloy steels handle the tough jobs. If you have a problem involving a need for a material with greater strength and toughness . . . with greater resistance to abrasion, impact, corrosion, fatigue . . . a nickel alloy steel may very well prove to be *your* solution. Let us know about your problem. We'll be glad to provide engineering data to help you find the answer.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N.Y.

INCO NICKEL

NICKEL MAKES STEEL PERFORM BETTER LONGER

New Wage Pattern Still to Be Set

- Companies' 5% offer is only a starting point as the unions see it. They object to the 2-year contract provisions.
- Wage average in the industry has already moved to a new high this year.

THERE'S plenty of talking yet to be done before oil management and unions finally hammer out a 1961 wage pattern for the industry.

The offer of a 5% general wage increase by a few oil companies has broken the ice. But it has left this confused wage picture:

...Majority of unions involved so far has rejected the offers. Union leaders feel the offers fall short of labor's goals but are encouraging starting points for further talks.

...Many other oil companies term the offers too much and too early and say they are not prepared yet to make any definite commitments.

...Some nonunion employes in companies making the offer already have the 5% raise.

The offer . . . First company to make the 5% across-the-board wage increase was Indiana Standard and its affiliates.

The increase took effect immediately for unrepresented, nonexecutive employes in the general office and would be effective for union employes when accepted. The offer to the unions was tied into acceptance also of a 2-year contract with a clause preventing reopening of wage negotiations for the 2-year period.

Amount of the pay increase varies among the different wage brackets. Indiana Standard estimates it will average out at about 15 cents an hour.

Following Indiana Standard's move, similar wage-increase offers were made by Atlantic Refining, Sun, Socony Mobil, Standard Oil of California, Husky Oil, and Rack Island Refining. Husky's offer was for a 2½% pay raise each year for 2 years. Rock Island offered the 5% raise for only 1 year.

Union position . . . Only one independent union has accepted the Indiana Standard offer, while other organized groups in the company have rejected it.

The Research, Engineering and Professional Employes Association, representing about 425 employes at the Whiting refinery, accepted the 5% raise effective November 18.

Two other independent unions at Whiting made counterproposals to the company offer. The Office Employes Association offered to accept a 5% pay raise under a 1-year contract retroactive to March 24. The Independent Petroleum Workers of America, representing 4,400 Whiting workers, offered to accept the 5% increase under a 2-year contract if the company would pay an additional 15 cents per hour per employe into the employe benefit plan starting November 16, 1961. None of the counter offers met with management approval, and a temporary impasse in talks developed.

The Oil, Chemical & Atomic Workers International Union, largest organization in the industry, meanwhile recommended to all its locals receiving the 5% offer to turn it down. OCAW locals are involved in nearly all the companies so far making the long contract offer.

An OCAW spokesman in Denver said international officials of the union were encouraged by the offer but noted it has three shortcomings:

...A 2-year contract. The OCAW is not unilaterally opposed to long contracts. In the chemical industry it has some 3-year contracts. But union officials reaffirm that there must be a "wage sweetener" in the contract sufficient to make them sign for a long term.

...Short of goal. The union estimates the 5% offer would mean about 14.5 cents an hour for a 2-year period whereas the union's national wage goal is 18 cents an hour for 1 year.

...Basis of the pay raise. The offers thus far have been for percentage increases while the union this year is asking for a definite hourly increase.

Explanation for the union position on a percentage versus cents per hour raise is this: The last general raise in early 1959 was a percentage increase (5%) which means that workers in the higher pay brackets got the largest increase. Another percentage increase would accentuate this difference and tend to throw wage differentials between jobs out of balance.

How Oil Workers' Pay Hit an All Time High

- Hourly rate comparison shows that the spread between refinery wages and all manufacturing averages is now 72 cents, and the difference between production and all manufacturing averages is 53 cents . . .

	Refining average	Production average	All mfg. average
*1960	$3.01	$2.82	$2.29
1959	2.98	2.81	2.22
1958	2.83	2.69	2.13
1957	2.78	2.61	2.07
1956	2.65	2.48	1.98
1955	2.46	2.32	1.88
1954	2.37	2.27	1.81
1953	2.32	2.21	1.77
1952	2.20	2.09	1.67
1951	2.08	1.95	1.59
1950	1.93	1.82	1.47

Source: U. S. Department of Commerce * Average first 10 months

That's why the union this year prefers a cents per hour pay increase.

OCAW officials actually thought so little of the 5% offer that they did not present the matter to the wage-policy committee which set the union goal of 18 cents an hour this year. The committee must approve any deviation from the goal before an offer can be accepted by individual locals.

Chances of settlement . . . The early offers at least indicate that some oil managements think a wage increase of some sort is inevitable this year.

This feeling isn't shared by all managements, however. They won't comment on their plans at this stage of developments. The least they will say is that so many of the negotiations have just begun and it's too early for a pattern to develop.

Sinclair, which has the only national contract with OCAW, for instance, held its first sessions with union representatives in mid-November in Kansas City. Both sides presented their positions and then adjourned for later sessions.

Labor talks at Humble's big Baytown plant are stymied until the OCAW and an independent union settle bargaining rights. Last election on the issue ended in a tie.

An estimated 200 major contracts are open and are being negotiated in the industry, and it could be after the New Year before the unions and management are satisfied on a common basis for settlement.

No matter what eventually emerges, the average hourly pay of refining workers has edged over the $3 mark for the first time. Statistics compiled by the U. S. Department of Commerce show that for the first 10 months of 1960, refining workers averaged $3.01 an hour compared to an average $2.98 last year. Petroleum production workers averaged $2.82 an hour for the first 10 months. These figures compare with $2.29 an hour averaged by manufacturing workers.

Gas Discovery Off California Confirmed

• Phillips group has strike in waters off Santa Barbara County and is drilling second test. Socal, Humble also hit to the west.

A NEW gas-producing province is in the making off the coast of California.

It long has been rumored the tight holes being drilled off Santa Barbara County have discovered gas. The rumor was confirmed in part last week by Pauley Petroleum, Inc., part owner of Parcels A and E. Phillips Petroleum Co. is operator and biggest interest holder in the two blocks.

Pauley, in its annual report, disclosed a well on Block A has been completed as a "gas well rich with distillate." The well was whipstocked from an onshore location to a total depth of 8,871 ft. (OGJ, Oct. 10, p. 119). A second well currently is making hole from the onshore site.

Standard Oil Co. of California and Humble Oil & Refining Co. also reportedly have come up with a gas pool in wildcatting on Parcel C, about 10 miles to the west. And the Texaco-Monterey-Newmont group apparently has found gas on Parcel D, A 28-well platform recently began development drilling on Parcel D, where Texaco is the operator.

Any gas production developed off Santa Barbara County will command a premium price. The offshore leases are only about 100 miles from Los Angeles, a booming gas market supplied primarily from out-of-state gas. The companies probably will get a price in the 30-cents and M.c.f. range for the gas.

More drilling . . . A new platform is scheduled to go to work next month off Santa Barbara County.

The Phillips-Pauley group is converting the Pacific Driller, a mobile platform, into a permanent platform for developing Parcel E, the western parcel of the five leased off Santa Barbara. The platform is being designed to handle 33 wells.

The group has drilled 11 stratigraphic tests in Parcel E.

Parcel E takes on added significance since it adjoins Parcel J, which will be leased by the state in February.

Citronelle Due 100 New Wells

. . . in $20-million deal by Jett Drilling and Frisco firm. The 4,000-acre block involved is on field's east flank.

JETT Drilling Co., Inc., of Shreveport has completed a multi-million-dollar deal with Ancora Corp. of San Francisco, involving 4,000 acres and at least 100 new wells at Citronelle field in Mobile County, Alabama.

Jett will drill and complete the wells in the tanks for Ancora in units of 10 wells each, according to the transaction.

Although neither Jett nor Ancora would mention a figure, the deal reportedly involves up to about $20 million.

Much of the acreage lies on the little developed east flank of the field. Part of the block also includes leases purchased in 1958 by Jett, Bart B. Chamberlain, Jr., of Mobile, and New York interests from Gulf Oil Corp.

Included in the deal is the proposed site for Citronelle's 20,000-ft. Smackover wildcat, which twice has been postponed by lease and title troubles. The deep test now is scheduled for SW NE 31-2N-2W. Spacing will be on 160 acres for oil and 640 acres for gas in case of production below the Sligo.

Jett already has started drilling locations for Ancora and expects to complete six wells by the end of the year. Ancora Vice President L. D. Wosk said the company hopes to complete the 100-well drilling program in 3 to 4 years.

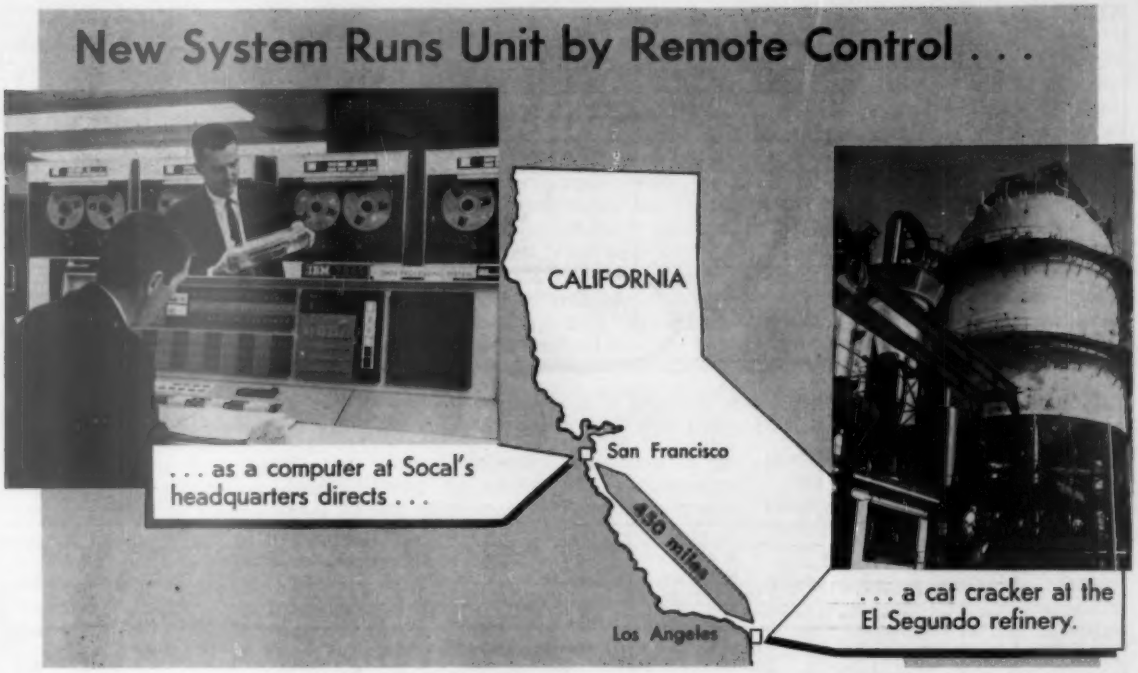
Ancora contemplates a separate corporate entity for its Citronelle interests.

Oil men claim the deal will be a major factor in revitalizing drilling in the field. Only 31 wells have been completed at Citronelle this year, compared with 54 at this time last year.

Citronelle presently has 254 producers. Production is from the Rodessa and Sligo sands. The field has averaged more than 18,000 bbl. daily since May, when new markets for the high-gravity crude boosted the output nearly 50%.

An operators' agreement for unitization at Citronelle also reportedly is near completion.

One oil official said the proposed secondary-recovery program at Citronelle was a major factor in the Jett-Ancora transaction.


New System Runs Unit by Remote Control . . .
CALIFORNIA
San Francisco
450 miles
Los Angeles
. . . as a computer at Socal's headquarters directs . . .
. . . a cat cracker at the El Segundo refinery.

Computer Controls Big Cat Cracker

• Standard of California unit gets new setting every 15 or 20 minutes. The improvement in plant operations covers the additional cost of the control program. Next step: A computer control at the site of the cracker.

A 40,000-BBL. fluid cat cracker at Standard Oil Co. of California's El Segundo refinery in Los Angeles is being controlled by a giant IBM 7090 located in the company's headquarters 450 miles away in San Francisco.

Direct control of the cat cracker is the first move in what is expected to be a series of computer-control developments by Standard of California.

The company has not revealed the direction its computer-control program will take next. However, it left the door open for running other refinery units with computers.

Socal pointed out a fluid cat cracker is one of the more complex refining units, so it is feasible to control less complicated units.

The computer installation for the cat cracker has improved plant operations enough to make up for the added cost of the control program. And the company indicated it will expand its computer control program to other units if the proposition seems economical in those cases.

Here's how the cat cracker is controlled:

About 50 instrument readings from the cracker's control room are continuously recorded, and every 72 seconds they are converted into electronic signals and transmitted to San Francisco. Readings are received in San Francisco on punched cards. The cards are fed into the 7090, and in about 5 minutes emerge as another set of cards with the most profitable plant-control settings.

As the results come out of the 7090 they are automatically teletyped to El Segundo, where unit operators can make necessary adjustments.

The only thing required of refinery personnel is supervision of the continuous feeding of information to San Francisco. In addition to the 50 instrument readings which are automatically sent to San Francisco, 96 other items of information can be manually fed into the transmission system by control-room personnel.

A new set of recommended settings is received at the unit every 15 or 20 minutes. The unit is connected to San Francisco through a system of leased telephone lines and IBM transceivers.

Change coming . . . Standard of California already has some changes planned in the cat-cracker system.

Next year the company plans to abandon the long-distance control setup and install a control computer at the cracker. The new system, like the long-distance system, will be an "open loop" setup which requires refinery personnel to supervise operators. However, the unit will be designed so that it can be converted to a "closed loop" which will be fully automatic.

Research . . . The El Segundo computer-control program is the outgrowth of a 3-year research program aimed at a computer program which would get the most from a barrel of crude.

The program was directed by California Research Corp., Socal's research arm, with an assist from IBM and Socal's engineering, manufacturing, and electronic computer groups.

The success of this program was cited recently by H. W. Crandall, manager of Socal's electronic computer center. Crandall said data processing had paid off with advantages amounting to "several hundred thousand dollars" in the past 3 years.

REGIONAL REQUIREMENT FORECAST — SUMMARY

DATE

PAGE	LINE NO.	REGION	CATEGORY	SIZE	WT.	SPEC.	SIZE	WT.	SPEC.	SIZE	WT.	SPEC.	SIZE	WT.	SPEC.	SIZE	WT.	SPEC.	SI
25	1			5	12	170 000	5	12	170 000	5	12	170 123	5	12	170 000	5	12	170 000	5
				GRADE		THREAD	GRADE		THREAD	GRADE		THREAD	GRADE		THREAD	GRADE		THREAD	GR
	2			J0 55		S T C	J0 55		L T C	J0 55		L T C	J0 55		B 0T	N0 80		L T C	N0
				WELLS		FEET	WELLS		FEET	WELLS		FEET	WELLS		FEET	WELLS		FEET	WELLS
	3	10	REQ D																
	4		UNALL						864						271			3 852	
	5		ONORD																
	6		OV SH						864						271			3 852	
	7	20	REQ D				3		4 400							3		5 950	
	8		UNALL						130									3 738	
	9		ONORD																
	10		OV SH						4 270-									2 212-	

TUBULAR-GOODS NEEDS are forecast with the help of a computer. The circled area show Atlantic's Region 20 (code name) has only 130 ft. of 5½-in. J-55 casing with long thread and coupling. Three wells planned will require 4,400 ft., so 4,270 ft. must be obtained.

PAGE NO. 9 — MASTER INVENTORY RECORD — CASING & TUBING — DATE

DESCRIPTION						LOC.	INV. BALANCE		ENROUTE OR LEASE & FIELD				THEORETICAL BALANCE	ALLOCATIONS				TOTAL ALLOCATED	AVAILABLE
SIZE	WT.	GRADE	THRD.	R	SPEC.	ST. YD.	JTS	FEET	DATE	CAR NO.	JTS	FEET		QTR.	REG.	WELL	FEET		
						ALLO				MARS MCLEAN TR				20	30	3	1525		
						TOTAL		3468					3468					2950	518
41/2	1660	E000	H FJ	1		ALLO				E P PULLIN 1				20	30	4	1425		
						TOTAL													
41/2	1660	E000	H FJ	2		3100		45					45						45
						TOTAL		45					45						45
50/0	1150	J050	ST C	2		1300	5	155					155						155
						TOTAL		155					155						155
50/0	1500	J055	LT C	2		5300	9	308					308						308
						TOTAL		308					308						308
50/0	1500	N080	LT C	2		1200	3	100					100						100

MASTER RECORD gives an up-to-the-minute picture of inventory for each tubular goods item. Computers and printer do this job in 30 minutes. Circled figures tell Atlantic that programed wells will reduce stock of a certain grade of 4½-in. pipe to only 518 ft.

Automation Speeds Tubular-Goods Inventory

● Atlantic's mechanized system gives a fast check of pipe stocks and expected needs. It makes it easy to pare excess inventories and costs.

ATLANTIC Refining Co. feels it has found an answer to a growing problem for nearly all large oil operators.

The problem: How to keep closer tabs on materials inventories, especially tubular goods, so that money needed elsewhere isn't locked up in the form of unneeded supplies (OGJ, Aug. 8, p. 56).

Atlantic's answer is mechanization. The company is using an IBM punched-card system at its Dallas producing headquarters to keep track of its stocks of tubular goods over its entire domestic operating area, including Canada. The big advantage of the system is its ability to speed up data reports.

On almost any given day, the company can tell you exactly how much of any tubular goods item it has and where. Moreover, the company knows on that day just how much of its inventory will be sucked up by drilling in the next several months.

With this information on stocks and needs, Atlantic is in an ideal position to cut its inventory costs to the bone.

The company started its streamlined system in July. It is already realizing the benefits. Items in surplus are quickly spotted. They are either traded or sold to other companies, or distributed to some other Atlantic district where they are needed.

This is not a penny-ante game Atlantic is playing. The stakes are big. Just a few strings of heavy specialty casing, for instance, may cost a quarter of a million dollars or more.

The old way . . . Atlantic has district offices in Texas, Louisiana, Oklahoma, Kansas, Arkansas, Wyoming, and Canada, with one or more pipe yards in each.

Formerly, each district office reported daily to Dallas on movements in or out of its tubular stocks and entered them in a ledger. A master ledger was kept in Dallas. This system showed the company what it had today but not what it would have or need 30 days ahead. Searching the

ledgers for substitutions or for making issue studies was a laborious task.

Periodic drilling requirements forecasts had to be screened against these ledgers, which was time consuming and used considerable manpower. Drilling programs are subject to quick and frequent change and the manual forecasts could not be readily revised. Consequently they soon became outdated.

And the new . . . Atlantic has junked the old ledger system.

IBM cards were prepared for every individual item of tubular goods used by the company—each size, weight, and grade of pipe or tubing. Duplicates of this master deck are kept at the district offices. Each district and each yard in the district was coded.

When an item of tubular goods is used, the district office pulls a card for that item, fills in how much was used and where, and mails it to Dallas.

There, each week, cards from the districts on all tubular goods movements, either incoming or outgoing, are run through an IBM 650 computer which turns out a new master deck bringing the company inventory up to date.

Drilling included . . . At the same time, Atlantic worked into the mechanics of the system a way of keeping up at all times on its future drilling requirements for tubular goods.

It makes a quarterly study of drilling plans. Then a casing-tubing program is designed for each well to be drilled in that coming quarter.

The quarterly study is kept as a running forecast and revised at least once a month. The drilling-requirements forecast data also is punched on cards. Any spur-of-the-minute well is thrown immediately on these "planning" cards.

All tubular goods are "allocated" from the plan. That is, they are labeled as reserved items for a particular well.

All tubular-goods allocations and purchase requests for wells are made in Dallas. Upon receipt of a request to allocate tubular goods to a well, Dallas sends a form to the district office showing what was allocated and where to get it. The district doesn't pull the cards for these items, however, until the goods are actually moved from the yards to the well.

New master report . . . The master deck of inventory cards when run through the computer with the "planning" cards gives Atlantic a report of just where it stands in respect to tubular-goods stocks.

Cards with the combined data are converted via an IBM 407 accounting machine to a printed master inventory record.

This report, coded by region, shows just how much of each item of tubular goods Atlantic has in its individual yards. It also shows how much of each is allocated to planned wells, how much is left unallocated, how much planned wells not allocated will soak up, and how much will be left.

In brief, this tells the company how its supply of each item of tubular goods stacks up with its demand company-wide and as to each individual district.

Forecasts of needs several months in advance are subject to some change, of course, due to changes in drilling plans. Production may have to retailor its tubular-goods requirements for many reasons. Planned wells may be scratched due to lease problems or offset failures. A well planned as a dual might have to be re-designed for a single completion, or vice versa.

But the system is built to accommodate such changes quickly.

The advantages . . . With its finger on its inventories so effectively, Atlantic is in position to know quickly and surely when a certain type of tubular goods is in surplus in any particular area or overall.

It is in an ideal position to keep its stocks at a minimum, thus freeing capital for more productive use. Atlantic intends to make full use of this advantage. It will buy readily available items only as it needs them.

It now knows whether it can safely get rid of some of the slower-moving items it has in stock and is alert to seize opportunities to sell or trade such items for others it can readily use.

Atlantic feels there is apt to be more inter-company trading of tubular goods in the future. And the company periodically prepares a list of surplus items. It is one of a dozen or so companies trading lists to promote inter-company trades or sales.

The new IBM system has also proved its merit in saving time and labor.

Field offices no longer make daily reports on withdrawals or additions. The drilling and production departments do not have to devote much time and effort to widely spaced drilling - requirements forecasts. The current continuous revision of forecasts is relatively painless.

The system too, is much faster. It takes only a matter of minutes each week to run out a full report.

Stocks in dollars coming . . . Management of Atlantic's tubular inventories is the responsibility of the Materials Section of the Production Division. H. D. Robinson is materials superintendent.

The plan for overhauling of inventory procedure was devised by the company's industrial engineers, the Methods and Standards department.

Rex Struble, head of Methods and Standards, says there is more to come. Currently, the company's Production Division records of stocks of pipe and tubing are expressed conventionally in feet. Struble hopes soon, however, to also express them in dollars.

Atlantic management then will be even better armed to make fast and accurate decisions involving its tubular goods supplies.

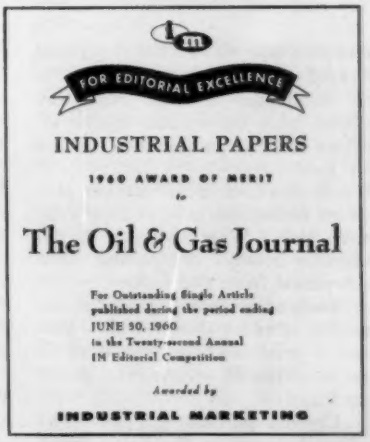
Journal Wins Award for Editorial Excellence

THE Oil and Gas Journal has received the coveted 1960 Industrial Marketing Award of Merit for its popular 16-page report on 27½% depletion.

The award, "for editorial excellence," was one of 46 out of 703 entries in IM's 22nd Annual Editorial Achievement Competition for Business Publications.

Called "The Case for 27½% Depletion," the article was an immediate success after publication February 23, 1959. Oil companies and individuals ordered more than 56,000 reprints.

The article dealt with a complex subject in simple, easy-to-read style.



Panhandle Gas Field Gets Proration "Cure"

• Big East Panhandle field comes under proration for the first time. Order should help cut drainage and nonratable take between leases and also between the East and West Panhandle fields. But a spacing dispute still exists.

HUGE East Panhandle gas field, with more than 1,200 wells and yearly gas output of about 60 billion cubic feet, will go under proration January 1 for the first time in its long history.

Moving suddenly last week, the Texas Railroad Commission ordered East Panhandle prorated to minimize current widespread drainage and nonratable take not only between leases within the field but also between East and West Panhandle fields.

The action capped a year of intermittent hearings at which various operators in East Panhandle and along the artificial boundary between the East and West fields maneuvered either to move the boundary or to equalize in some way the divergent rules governing production in the two fields.

East Panhandle allowables currently are still based solely on well potential—under the 25% of open-flow statewide rule which applies to any gas field until special field rules and proration formulas are adopted. This gives no weight at all to acreage, and gives a well on 10 acres the same allowable as one on 160 provided their potentials are the same.

The order for the field will prorate field production two-thirds on acreage and one-third on the well.

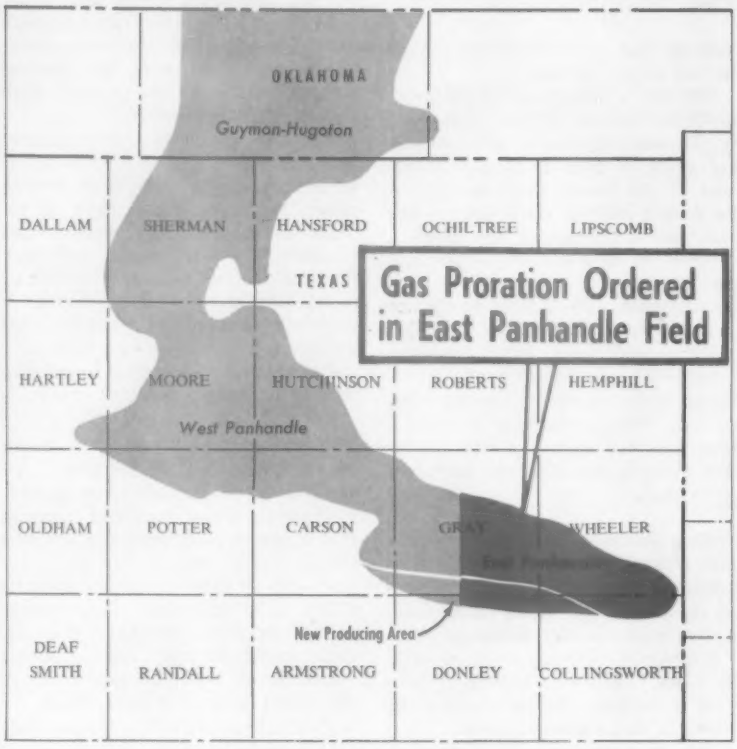
This formula will more nearly approximate the proration formula in West Panhandle field (which is based two-thirds on acreage with the remaining one-third figured from a combination of factors including deliverability and rock pressure).

Nonratable take hit . . . The order thus will tend to cut gas drainage from West Panhandle to East Panhandle resulting from the current higher allowables for comparable wells in the latter field.

It will also tend to smooth out pronounced nonratable take in East Panhandle itself. Wide variance in gas production between comparable wells has stemmed from two factors:

. . . Lack of an acreage factor in the allowable mechanism—which permitted a small-tract well to have as large an allowable as one on a much larger lease.

. . . Uneven purchasing. Several pipelines buy gas in the field. Some need all the gas they can get from their connections, while others take amounts far under the allowables. This has tended to sharpen the inequities.



Under the present setup there is far more allowable productive capacity than actual demand for the gas—and no way to equalize the existing demand among wells in the field.

Allowable productive capacity in the field now stands at about 474,586,000 cu. ft. daily. Demand for gas from East Panhandle, on the other hand, is running only about 285,745,000 cu. ft. a day.

This has resulted in some startling discrepancies. A producer told the Journal one of his East Panhandle wells was able to sell in the past year only 60,000,000 cu. ft. of gas, whereas a direct offset in the same period produced and sold more than 1,000,000,000 cu. ft. The two wells, he said, had virtually the same potential.

Why so long . . . East Panhandle has been rocking along for many years under the current regulations. Field rules that called for 160-acre spacing but carried no special proration formula were adopted by the commission November 7, 1955.

The nonratable-take issue, however, was not raised until January of this year. Why?

As various producers pointed out in hearings in January and June and at two state-wide hearings later, the entire picture has changed drastically in the past few years due to new development in the field.

In 1955, East Panhandle was an old field. Bottom-hole pressures, generally very low, were declining rapidly and at a relatively uniform pace.

In the past few years, however, operators have used fracturing techniques to open prolific production in dolomite otherwise too tight to produce. The new operations are south of the older production.

Hundreds of new wells have been completed using frac treatments in the general area of the boundary line separating the East and West Panhandle pools. And now pressures are

not relatively uniform in the area.

Rock pressures in the newer area are far higher—ranging up to 350 psi. and above as compared to pressures as low as 7-8 psi. in the older portion. Heavy drainage from the new to the old area under the present setup was inevitable.

West Panhandle affected . . . The West Panhandle field, with 2,774 wells producing a whopping 533 billion cubic feet last year, also was adversely affected by this situation.

Producers had long recognized that the two fields actually were one reservoir. But when the boundary line was fixed in 1935, it was felt that a belt of tight dolomite along which the line was drawn would prevent substantial drainage between the two fields.

Then the introduction of fracturing made this boundary completely artificial. This caused consternation among West Panhandle field operators near the line. Along with the lower allowables in the West, field rules there called for 640-acre proration units as compared with only 160-acre spacing in the East Panhandle area.

Some battling still ahead . . . Though proration in East Panhandle will tend to cut down on the drainage from the West field to the East, it will not prove a complete cure-all due to this spacing discrepancy between the two.

A suit has already been filed in district court in Austin by one West Panhandle operator, W. H. Taylor et al., to force the Railroad Commission to permit him to infill drill his acreage adjoining the boundary on 160 acres so as to compete on even terms with offsetting producers in East Panhandle.

This situation, no matter which way it goes, could cause the commission all sorts of regulatory headaches.

Effects on East field . . . Producers and pipeline purchasers active in the field appear to feel generally that proration in East Panhandle will have little noticeable effect on total production in the near future.

But actual production, as between individual wells, should change considerably.

Here is what can be expected:

. . . New-area operators, especially those on larger tracts, will get a larger share of the limited demand than at present.

. . . Wells on small tracts—no matter whether they are in the new area or in the higher-pressure areas in the older portion of the field—will see allowables cut.

. . . Old wells with very low pressures will not be affected. Though there were contentions by some during the hearings that hundreds of the old wells would have to be abandoned, rules and practices conventionally followed by the commission testify otherwise.

Small gas wells are protected by a "floor" provided in the statutes which spell out that:

1. A well with a daily natural open flow of 200,000 cu. ft. cannot be restricted to less than 50,000 cu. ft. daily. And,
2. A well with a daily natural open flow of less than 200,000 cu. ft. cannot be restricted to less than 25% of such natural open flow.

Application of these rules would leave the large number of "last-gasp" producers in East Panhandle completely untouched by proration.

One of the prime ramrods in the drive for proration in East Panhandle was Amarillo Oil Co. The company, whose stake in the field was increased sharply when it purchased large-scale production of Warner Oil Co. this year, played a leading role in the formal East Panhandle hearings in January and June.

It carried on the fight individually by further petitioning the commission to prorate the field at the state-wide allowable hearings in October and November.

By so doing, the company was admittedly laying the groundwork for a court fight to force East Panhandle proration in case the commission failed to act.

Economy Plan for East Texas Field Loses Out

THE TEXAS Railroad Commission last week slammed the door on an economy plan proposed in September by two major operators for East Texas field.

The proposal would have cut operating costs an estimated $22,000,000 in the 1960's by shutting in several thousand of the big pool's wells.

The allowables of the shut-in wells would have been transferred to other wells in the field, leaving unaffected total field production, royalty and tax payments, and status of East Texas' 3,100 marginal wells.

The East Texas proposal represented the industry's biggest single effort yet to cut costs in existing fields where overdrilling had long since occurred. (OGJ, Aug. 22, p. 44, and Sept. 26, p. 110).

The Railroad Commission based its denial on grounds that approval of the plan would not result in added oil recovery.

It added in its order: "The wells in the East Texas field were permitted to be drilled densely so as to recover the greatest ultimate amount of oil from the sand of the reservoir.

"The recovery of oil has been remarkable and has exceeded the most optimistic forecast made at the time the producing limits of the field were outlined. In fact, the field has produced 3,442,632,569 bbl. of oil to date and the life of the field is predicted beyond 30 years in the future. A high percentage of recovery is expected . . ."

The commission thus adopted arguments put forth at the hearing on the proposals by a large group of East Texas citizens who apparently feared the region's economy would be hurt through loss of employment and lower income from oil equipment sales and services.

The shut-in plans, proposed by Atlantic Refining Co. and Tidewater Oil Co., were generally approved though not actively supported by most major operators and a large group of independents.

Economics ruled out . . . In its ruling, the commission apparently is saying that it will not approve operator plans which include allowable transfers.

This, some feel, will put a large dent in operators' attempts to improve the scant-profit situation by applying operating economies and modern technology in older, overdrilled fields.

Atlantic's East Texas plan would have shut in seven of each eight prorated wells, with the permissive allowable-transfer distance restricted to a radius of 950 ft. from the well designated as the producer.

If applied field-wide, it would have cut the number of producing wells in the field to about 8,300 from a present total of 19,250 prorated and marginal wells.

The Tidewater plan, in essence, would have closed in two of each three prorated wells.

The proposals stemmed from a situation wherein the basic allowable for most prorated East Texas field wells had sunk to a skimpy 6 bbl. daily.

Petrochemical Firm Looks Abroad to Survive

• Texas Butadiene & Chemical Corp., squeezed between tougher competition and expiring sales contracts at home, pins its hopes on extensive foreign operations. First public offering of stock is being made to clear track.

CHANGING conditions in the U. S. butadiene and avgas markets are behind the shift in business strategy being made by Texas Butadiene & Chemical Corp., New York.

Hemmed in at home by ever hotter competition resulting from excess industry capacity on the one hand and expiring sales contracts on the other, the company is looking abroad—not only for survival but for major growth.

Although it has been operating less than 4 years, TBC is altering both production and marketing patterns to cope with new circumstances in an industry whose only predictable facet is change.

The new defensive and offensive moves are designed to counter its vulnerability as a chemical independent without captive markets.

To be in a better position to finance new enterprises necessary to stay competitive, the company acted last week to make its first public offering of common stock. This tactic is part of a company strategy which has as its main aims:

...Foreign investments in synthetic-rubber facilities which will be profitable in themselves and will at the same time provide markets for butadiene produced at TBC's Houston plant. The company expects foreign sales of butadiene to increase substantially in the next few years.

...Expansion of production capacity at Houston and changes in yield patterns to meet market conditions.

...A push for commercialization of new products which are being created at a dizzying pace.

TBC background . . . TBC was organized in 1954, a product of the Government's drive for increased production of aviation gasoline.

A government certificate of necessity provided the basis for financing an unusual plant in Houston which put the new company into the business of producing butadiene as well as avgas. The plant went on stream early in 1957.

Principal owners of TBC are Cabot Corp. and the big investment banking firm of Carl M. Loeb, Rhoades & Co.

For the 8 months ended August 31, net income was $2,772,055 on sales of $30,495,885 compared with net income of $1,950,424 on sales of sales of $27,340,347 for the same period in 1959.

Of the consolidated net sales for the 12 months ended August 31, avgas comprised 49%, butadiene 34%, synthetic rubber 16%, and miscellaneous byproducts 1%.

New market conditions . . . All sales of avgas have been made under a 5-year government contract designed to permit TBC to recover the $15 million invested in alkylate facilities by June 30, 1962. That is the date on which the contract expires.

After that time, TBC will have to compete with major refiners in this market. Although it is still substantial, the avgas market is shrinking with the advance of the jet age. And TBC expects no substantial sales of this product after the contract expires.

Almost all sales of butadiene are made under long-term contracts to four major rubber companies that signed up the supply before the plant was built. These contracts expire over the next 3 years. Two expire at the end of 1961, one at the end of 1962, and the fourth at the end of 1963.

Excess producing capacity in the U. S. has resulted in extreme competition, which has brought about several price cuts in recent years, the last one scarcely 2 months ago.

Foreign markets beckon . . . When the recession of 1958 hit, TBC had to look around for a home for much of its production.

Fortunately, the company's need for new markets coincided with increasing world demand for both butadiene and synthetic rubber, particularly in Europe.

TBC pioneered in exports of butadiene, and also developed sales of synthetic rubber made by other companies from TBC raw material.

For the 12 months ended August 31, exports accounted for 15% of TBC butadiene sales and all of the rubber sales. Foreign business, conducted by a wholly owned subsidiary, Texas Butadiene & Chemical International, Ltd., is expected to comprise a steadily rising percentage of total revenues.

French project . . . TBCI will soon be in business as a producer of SBR synthetic rubber in France.

The company owns a 30% equity interest in Soc. des Elastomeres de Synthese (SES), which will complete a plant near Marseilles next May. Other owners include Shell, the St. Gobain interests, Michelin, Dunlop, and Kleber-Colombes. This plant of 50,000 metric tons per year can be expanded to 70,000 metric tons with relatively small additional outlay.

When the SBR plant has been completed, SES will start on a butadiene plant with a capacity of 35,000 metric tons, to be finished late in 1963. Total cost of the combined projects will be $38 million.

Argentina, Sweden next? . . . TBCI has another rubber project in the works in southern Argentina.

The company last year received authority from the Argentine Government to build synthetic-rubber facilities, and negotiations for financing are under way.

This project, too, would be built in two phases. A synthetic-rubber plant of 40,000 metric tons is planned first. Two years after its completion, a butadiene plant of 30,000 metric tons is to be started. Each plant is

INDUSTRY

Marketing facilities of Central Petroleum Corp., Lexington, Ky., have been bought by DX Sunray Oil Co. Facilities of Central Petroleum, which has been a distributor of DX products for 4 years, include four bulk plants and 12 service stations in eastern Kentucky. Acquisition was the second purchase of marketing outlets by DX Sunray last month. Earlier, the company bought Goyer Oil Co. in Greenville, Miss.

Wyoming's state mineral supervisor has asked the Rocky Mountain Oil and Gas Association to suggest changes in the regulations of the Wyoming Conservation Commission. The association says it has become increasingly apparent to the oil industry and to state officials that a revision of rules is needed.

estimated to cost about $18 million.

TBCI also is considering participating in a similar project in Sweden.

Houston plant expansion . . . In anticipation of growing foreign markets, TBC expanded its Houston plant this year from the original 65,000 tons to 100,000 tons per year.

Through improved operating techniques and a capital outlay of $2 million, butadiene capacity was increased while avgas capacity was held at 3,200,000 bbl. per year.

New products . . . TBC last year switched emphasis of its research and development from process improvement to new-product development. It acquired domestic and foreign rights to two families of new polymers.

One involves a polymerization process by which low-molecular-copolymers of styrene and maleic anhydride are formed. The other involves polymerization of butadiene alone or with other monomers. TBC reports that basic U. S. patents have been obtained on the first process and patents have been applied for in 31 countries.

If pilot-plant quantities of these copolymers receive favorable customer reaction, new facilities will be built for commercial production.

TBC also is working on methods to produce high-purity propylene, butylene-1, butylene-2, isoprene, and similar olefins which would be marketed in the plastics and chemical industries. The company has marketed small commercial quantities.

Phillips Case—Back to Court?

• Legal test of the FPC's ruling in the classic dispute may be next, now that the agency has denied a rehearing.

THE Federal Power Commission has turned down requests for a rehearing of the Phillips case decision, thus setting the stage for a possible court test.

The FPC said in denying a rehearing that no new facts or principles of law had been raised, and that a hearing therefore was not justified.

Those seeking a rehearing have 60 days in which to take their appeals to court. It is considered likely that one or more of the companies will take such action.

Applications for rehearing had been filed by Minneapolis Gas Co., the State and the Public Service Commission of Wisconsin, the Michigan Public Service Commission, Public Service Electric and Gas Co., the State and the Public Utilities Commission of California, and a group of eastern seaboard distributing companies.

Phillips Petroleum Co. had filed no plea for a rehearing and thus has no grounds now for a court test.

Status of policy . . . The FPC also has rejected a request by three groups for a rehearing of the policy statement which the commission issued at the time of the Phillips case decision.

Meanwhile, 18 producers—including Phillips—have filed with the FPC their views on the commission's policy statement.

The producers said they were not expressing agreement or disagreement with the principle of area pricing, but were suggesting what they felt should be done if the area-pricing plan is to be followed.

They urged as a first step by the commission an immediate review of the area boundaries the FPC set in the policy statement.

The producers said the areas should be determined on the basis of geologic, operating, and economic factors and not on state or other political boundaries.

They said, too, that the dual-pricing arrangement should be eliminated so that the price would be the same for "new" gas and old contract prices.

In addition to Phillips, producers signing the statement filed with the FPC were Continental Oil Co., Hunt Oil Co. and five separate Hunt Trust estates, Murphy Corp., Ocean Drilling & Exploration Co., Pan American Petroleum Corp., Shell Oil Co., Sinclair Oil & Gas Co., Texaco Inc., the Ohio Oil Co., Pure Oil Co., Superior Oil Co., and Tidewater Oil Co.

BRIEFS . . .

Stockholders of Pacific Petroleums Ltd. will meet in Calgary December 20 to decide on a proposal for acquiring all Canadian oil and gas properties of Phillips Petroleum Co. and Sunray Oil Co., a subsidiary of Sunray Mid-Continent Oil Co. An agreement by officials of the three companies calls for issuance of new shares of stock in Pacific Petroleums in exchange for the properties. This would give Phillips 39% of the Canadian firm's stock and Sunray would own 5.8%. The stock value is estimated at $70 million for Phillips and $10 million for Sunray.

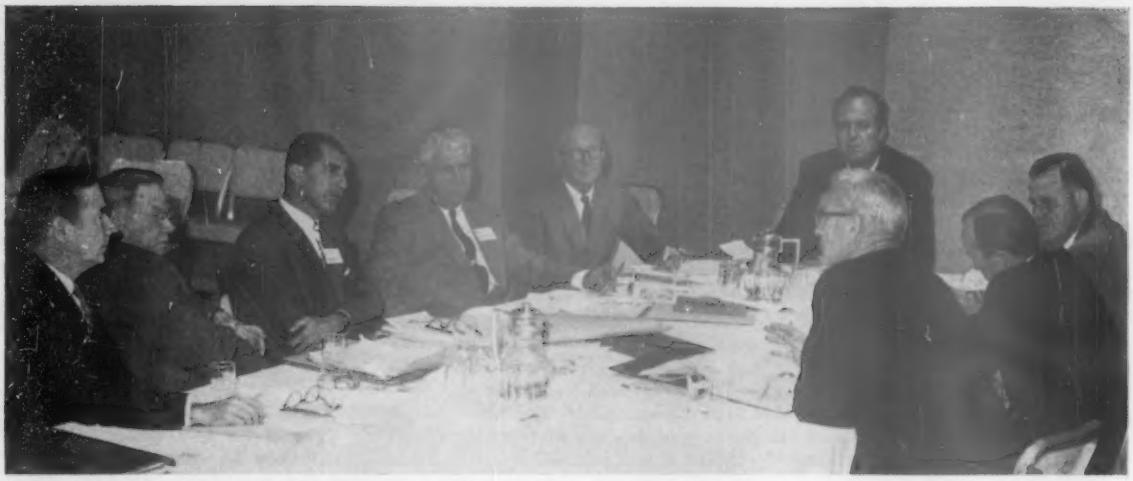
Sales in the gas utility and pipeline industry during September showed a 5.4% gain over the same month last year. The American Gas Association reports monthly sales to ultimate consumers totaled some 5.5 billion therms, compared with 5.3 billion therms. Gas sales to industrial users reflected a 6.4% year-to-year gain, while sales to residential and other consumers were up 2.7%. The increase in total gas sales for the year ending September 30 was nearly 7%.

Acquisition of Monarch Oil Co. has been approved by stockholders of English Oil Co. Monarch, a small firm in Salt Lake City, has about 35,000 acres of oil and gas leases in Utah. Stockholders of Monarch will swap 87,000 shares in their company for 217,000 shares in English Oil.

Full working interest in about 7,500 acres of proved gas leases in Marion County, Kansas has been acquired by the Texstar Petroleum Co. from the Can-Am Petroleum Co. of Wichita, Kans., and others. The Texstar Corp., parent of Texstar Petroleum, plans to start a drilling program on the acreage which is located in the East Antelope gas field.

By merging three subsidiaries into one, Franco-Wyoming Oil Co. has moved to streamline its oil operations. Under the new corporate setup, McElroy Ranch Co., Fort Worth, will absorb Franco-Central Oil Co., Wichita, and Franco-Western Oil Co., Bakersfield, Calif.

Stockholders of Kirby Petroleum Co. have approved a change in authorized capital stock from 4,650,000 shares of 20 cents each to 930,000 shares of $1 par value and authorized the creation of 400,000 shares of 5% cumulative preferred stock at $10 par value. Under an exchange plan being considered, the company would reduce its capital shares outstanding to 615,048 compared with the present 3,075,216.



NINE MEMBERS* of a specal AAPG committee that will try to overcome the troubles of the geological profession meet in Denver before launching a data-gathering survey of oil companies and colleges.

AAPG Sets Out to Diagnose Geology's Ills

• Committee is now quizzing those who teach geologists and those who hire them to find out what the future holds. The object: Find out exactly what's wrong, how long the problem will last, and make sure the profession is ready when the upturn comes.

THE AMERICAN ASSOCIATION of Petroleum Geologists thinks something has to be done about the ailments of geology. And the sooner, the better.

Hundreds of rockhounds are out of work. Hundreds of others have pulled out of the field. There are more and more empty chairs in classrooms where the science is taught.

A special committee of the AAPG will act as doctor.

To find out key facts about the crisis, the committee sent questionnaires to employers and schools. The replies will be analyzed for clues that could lead to cures.

Things started getting rough for geologists and geophysicists early in 1959. Sagging conditions in the oil industry caused many employers to whack payrolls. And one of the first places to feel the axe was the expensive item of exploration.

Steadily, the situation has grown darker. The AAPG is genuinely alarmed about the future. So few students are going into geology that the pool of trained personnel may be nearly dried up when the current setback ends.

What can the committee do?

Through its questionnaires, it hopes to be able to outline a plan that would:

... **Brake unemployment** in the profession.

... **Fend off any shortage** of earth scientists in years to come.

... **Swing teaching programs** more in line with company needs.

... **Try to make sure** the geologist gets a fair shake from his boss.

Head of the 24-man special committee is Orlo E. Childs, Phillips Petroleum Co., Denver. His group is called the Committee for Industrial-Academic Relations.

"We are deeply concerned by the current imbalance between employment opportunities in geological fields and available geologists," Childs said last week. "First we must make a factual assessment of today's situation, and that we are out to do."

A report on the project will be made at the AAPG meeting in Denver next April.

Two types of questionnaire went out.

Employer survey . . . One form was sent to oil companies, mining firms, and other employers. Spanning the period 1950-1960, it asks how many geologists and geophysicists were hired each year, how many were switched from domestic to foreign assignments, how many were fired and why.

Companies also are asked to spell out their job needs through 1965. And other questions are aimed at getting a rundown on basic salaries, degrees preferred, recruiting programs, plans for on-the-job training, and how the companies look on today's college courses.

Still another question deals with subsidies. Companies are asked:

"What is your attitude toward industrial subsidy of universities: Do you favor subsidy directed to students in scholarships, to faculty through research grants or endowed-chair providing partial salary, or to departments through equipment gifts? What is your company's present policy?"

Incidentally, the committee frowns on government-financed projects to help cure the ills of geology.

Colleges polled . . . The other questionnaire asks scores of colleges and universities for data on what's been happening in classrooms during the period 1950-1960. How many geology majors were there? How many degrees

*E. N. Goddard, University of Michigan, left; M. G. Gulley, Gulf Oil Corp.; Michel T. Halbouty, independent producer; A. J. Eardley, University of Utah; H. T. Morley, Pan American Petroleum Corp.; O. E. Childs, Phillips Petroleum Co., chairman of the committee; D. M. Kenney, USGS; F. H. Miller and G. A. Hill, Petroleum Research Corp. The committee has 15 other members.

were conferred? How many full-time faculty members staffed geology departments? How many companies interviewed geology students on campus in those years?

Among other questions, geological teachers were asked:

. . . **Whether students** have specialized too much.

. . . **Whether there was too much** use of students' specialization, or too little, after they went into industry.

. . . **Whether industry** has had much influence on student desires to keep studying on graduate levels.

These points touch on a growing problem in schools. Some college deans think courses ought to be pruned of "sidelines and frills." They argue that a sound education in "fundamentals" of a science should be backed up with on-the-job training.

College placement heads and oil company personnel chiefs have plumbed this idea. Some champion more on-the-job training—they point out that it would not only cut school expenses, but students would be groomed early for company needs.

The employment picture . . . Childs said he hopes the committee can come up with a figure on the number of unemployed geologists by the time the AAPG meets in April.

A poll last summer of those who had been included in an Earth Science Register indicated about 16% of 20,000 geologists and geophysicists who responded to the survey were hunting work. However, Childs said this result might not cover temporary employment in other fields.

In addition to asking companies for their job requirements through 1965, the AAPG is sounding other sources of possible jobs for members.

It has a committee investigating the chance of getting geologists into an expanded U. S. Geological Survey mapping program. This committee has reported that the agency's budget "is under very tight scrutiny," adding:

"One of the most accepted areas of operation in which additional funds might be allotted could be in an enlarged state cooperation plan.

"In this, state cooperative plans or defense-tied plans through the USGS budget might be set up. Once this is done, the AAPG could express itself in an active campaign to back needed projects."

The committee did not say how many geologists such an expanded program might absorb.

Key committeemen . . . The key members of Childs' committee include:

A. G. Alpha, Signal Oil & Gas Co.; M. G. Gulley, Gulf Oil Corp.; H. T. Morley, Pan American Petroleum Corp.; and J. S. Royds, Continental Oil Co.

Chairman of the committee division which polls independent oil companies is Michel T. Halbouty. Also in the group are R. D. Sloan, Humble Oil & Refining Co.; Carl Ulvog, Sunray Mid-Continent Oil Co.; Frank J. Gardner, The Oil and Gas Journal; Joe B. Hudson, Monterey Oil Co.; C. E. Brehm, consultant; and K. V. Schroeder, Sun Oil Co.

Childs appealed to those receiving the questionnaires to help shake out the bugs that have hampered geology in recent years.

The AAPG hopes to glean a pattern for progress out of the replies from employers, teachers, and representatives of 26,000 to 30,000 geologists and geophysicists.

AAPG Wants No "Handout" Jobs

ANY NOTION of creating phony "made work" at government expense to help unemployed geologists is out, says Orlo E. Childs, Denver, chairman of the AAPG's Industrial-Academic Relations committee.

The AAPG is urging an expanded mapping program by the United States Geological Survey. Bigger congressional appropriations might be required.

"Our profession should do everything in its power to advance the frontiers of knowledge with reference to natural resources of the United States," says Childs.

"There are many areas in our states where geological knowledge has little continuity. There is much work to be done.

"However, I feel very strongly this must not be in the guise of make-work programs for unemployed geologists. Rather, it must be judged on the basis of true value in advancing geological understanding of natural resources.

"Our profession cannot afford the position of being a select group of 'kept' scientists, dependent on government subsidy."

Tennessee Gas Revamps Units

TENNESSEE Gas Transmission Co., a 17-year-old war baby, has grown so fast and so big that it will have to adjust its corporate structure to fit its rapidly changing operations.

Organized originally as a long-lines gas-transmission company, Tennessee Gas in recent years has branched out into exploration and production, refining and marketing, real estate and insurance, and other diverse operations.

The board of directors of the $1.5 billion Houston firm decided last week to realign its many subsidiaries and divisions. The main purpose is to "draw a sharper line" between its regulated gas-pipeline operations and those which are not regulated, including exploration, production and refining.

Details of the realignment will be kept under wraps until organizational meetings are held. The job will be accomplished early next year.

The changes, Tennessee Gas hopes, will result in faster decisions in company-rate proceedings before the Federal Power Commission. Just why this is true the company did not say, but it expects to cut down extended rate litigation in Washington.

While announcing plans for changing the corporate structure, the company also made some important personnel changes (see p. 173), including the selection of a new president.

Gardiner Symonds, the hard-driving president and board chairman, relinquished the presidency to Harold Burrow but will continue as chief executive officer. Burrow moves up from executive vice president.

Tennessee Gas has a host of divisions, subsidiaries, and affiliates which operate its widespread interests. Its chief operating divisions are Tennessee Gas Pipeline Co., Tennessee Gas & Oil Co., Tennessee Oil Refining Co., and Tennessee Overseas Co. The overseas firm has a number of subsidiaries in South America and elsewhere.

Chief subsidiaries are Midwestern Gas Transmission Co. and East Tennessee Natural Gas Co., which operate regional gas-transmission properties.

Interior Going Ahead on Imports Cut

• Three-step program calls for 60,000-bbl.-a-day reduction in first half of 1961 for crude in Districts 1-4. Plenty of protests can be expected over such a move. Industry segments will push for some other changes.

INTERIOR Department intends to reduce crude-oil imports about 60,000 bbl. daily for the January-June allocation period, but its move to do this late last week apparently got tangled in governmental red tape.

However, the reduction is virtually certain to be made by one means or another, probably by making cuts after the January-June quotas—based on the old rules—have been announced.

This was the situation at The Oil and Gas Journal's press time:

Top Interior officials had definitely decided to put into effect the three rule changes which they had proposed recently.

However, they could not make the changes until a Presidential proclamation authorizing them was issued.

The proclamation was expected momentarily, but there were indications the Bureau of the Budget had advised the White House that it should be held up until other government departments, including the State Department and the Justice Department, had been given an opportunity to comment.

This delay created a problem at Interior, where officials had hoped to announce quotas for the upcoming 6-month allocation period by December 1.

The plan . . . The package Interior had wrapped up and ready for delivery last week was a reduction in crude-import levels through use of factors involving residual fuel-oil import increases, District 5 shipments into Districts 1-4, and correction in Bureau of Mines demand forecasts.

Specifically, crude imports into Districts 1-4 would be reduced by:

. . . Thirty per cent of the amount by which residual fuel-oil imports in the January-June period of this year exceeded the corresponding level in 1957. This difference was about 105,000 bbl. daily, so the 30% reduction would cut about 31,500 bbl. daily from the crude quota total.

. . . The amount by which shipments of crude oil, unfinished oils, and finished products shipped from the West Coast (District 5) into Districts 1-4 in the January-June 1960 allocation period exceeded such shipments during the corresponding period of 1958.

Since such shipments from District 5 into Districts 1-4 ran about 13,000 bbl. daily higher during the first half of this year than in the first half of 1958, this change means a cut of 13,000 bbl. daily from the allowable import total.

. . . Nine per cent of the amount by which estimated total demand in the preceding allocation period fell short of, or exceeded, actual total demand during that period.

Because actual demand in the first half of 1960 fell about 160,000 bbl. daily short of the estimate, the 9% reduction would mean a cut of about 14,500 bbl. daily.

The total of the three reductions outlined above would amount to a reduction of almost 60,000 bbl. daily.

Alternative plan . . . Because of the pressure of time, Interior decided at midweek that unless the Presidential proclamation were issued in a very few days, Interior would have to go ahead with an announcement of allocations for the January-June period.

If so, the allocations would have to be made under the existing rules, meaning that a cut would not be possible.

However, Interior would still be able to make reductions later—effective in the January-June period—if and when the expected Presidential proclamation were issued.

It would do this simply by ordering a reduction of about 7% in the company quotas that had been set up under the old rules. This would achieve the reduction called for in the proposed rule changes.

Interior would be able to do this legally, observers said, because the proclamation would give the department authorization to make such adjustments as it felt were needed to bring the import level into line with the new rules.

In other words, whether the rule changes are made immediately or later this month, the effect on the crude-import level for the upcoming allocation period will be virtually the same.

At any rate, that was the clearest picture available in the muddied Washington situation last week.

Industry reaction . . . Whatever means Interior used to put its proposals into effect, it was obvious that the result would not make many people in the oil industry overly happy. And some would be downright unhappy.

Producer groups had already indicated that while they were pleased by the changes Interior was proposing, they do not think the reductions would be enough to do much good.

Soon after Interior proposed its three-step program (OGJ, Oct. 31, p. 58), Minor Jameson, executive vice president of IPAA, said he thought producers generally would be pleased that the Government had recognized "the need for a further reduction in import levels."

Among other things, IPAA has recommended that imports be based on crude demand, that the military services be required to buy domestic fuel needs in the U. S. and that "historic" allocations for import quotas be eliminated.

Several major companies and others think the proposed changes go too far. In fact, they consider such revisions illegal and one or more firms may attempt to prove that in court.

Whether there is court action or not, there is little doubt that the tug of war over import regulations will intensify rather than diminish.

It is to be expected, for instance, that the Independent Petroleum Association of America, together with other producer groups, will continue to press for a switch to a crude demand rather than total demand as a basis for setting crude-oil import levels.

And there will be continuing pressure for a switch to refinery runs as the sole basis for determining individual quotas. This would mean elimination, or a gradual reduction, of the percentage "floor" now provided for "historic" importers.

Other issues, such as the increase in natural-gas liquids and in Canadian imports into this country, will also be debated vigorously.

The fact that a new Administration will take office in January will also help keep the import issue alive because each segment will be interested in "converting" new government officials to their particular views on how import controls should be handled.

Drilling Will Stick Close to Present Level

DRILLING activity probably will make a very slight increase in 1961.

A survey made by the market forecasting committee of the Petroleum Equipment Suppliers Association indicates that on a footage basis drilling will pick up 1% from 1960 for the United States and more than 3% in Canada and other free world areas.

The outlook is based on data from questionnaires sent to 23 firms, both oil companies and equipment manufacturers, trade journals, and trade associations that are likely to make independent forecasts on drilling. Forecasts were sought on rotary-rig activity, well completions, and new well footage.

Returns—summarized in the table—were received from 12 to 15 respondents for the United States, 9 to 11 for Canada, and 5 to 7 for other areas abroad.

The committee evaluated the average forecast for the United States and Canada as reasonable in light of its own analysis of conditions. The group, however, emphasized that forecasts for other free world areas were based on a very limited number of returns.

How Forecasters See Drilling in '61

	1960 Estimates*	1961 Forecasts*	Per Cent Change
United States:			
Rotary rigs	1,735	1,745	0.6
Completions	45,880	45,700	−0.4
New well footage (millions)	192	194	1.0
Western Canada:			
Rotary rigs	170	173	1.8
Completions	2,440	2,477	1.5
New well footage (millions)	13	13.4	3.1
Other Free World:			
Rotary rigs	1,020	1,057	3.6
Completions	5,135	5,320	3.6
New well footage (millions)	29	30	3.4

*Averages of replies.

Wide range . . . While the averages indicate some improvement next year in drilling, the wide range of the individual forecasts shows that considerable confusion exists on the outlook.

In the U. S. activity, for example, rotary rigs at work are expected to average 1,745 for a gain of 0.6%. But the range of the 12 forecasts was from 1,642 rigs busy to 1,850. Average for new well completions is 45,700 for a loss of 0.4%, but the range of individual forecasts was from 43,500 wells to 48,200. And footage averaged 194 million for a 1% gain while the range was 182 to 205 million feet drilled.

The forecasts for western Canada ranged as follows: Rigs 162 to 180 units active; completions 2,300 to 2,700; and footage 12 to 16 million. The range for free world areas was: Rigs 932 to 1,200; completions 4,656 to 5,700; and footage 28 to 33 million.

Economic factors . . . The PESA committee found at least three elements of strength among the economic factors affecting drilling activity next year.

The group felt optimistic about:

. . . Earnings of integrated oil companies. Initial reports for the first 9 months of 1960 showed profits about 5% above those for the same period in 1959.

. . . Inventory position of the industry. This has shown improvement. Stocks of crude and four major products are 3% below the level of a year ago. Domestic demand for products during the first 10 months was about 2% higher than last year.

. . . Prices of products. They have shown strength during the third quarter of 1960 and are about as high as they have been in the past 18 months.

Elements of weakness were seen in world overcapacity to produce crude, in failure of domestic crude demand to grow, in weakness of world crude prices, in low production allowables, and in the weakness of the general economy.

PROCESSING BRIEFS . . .

Texaco Inc., will build a 30-million-gal.-per-year benzene plant, one of the world's largest, at its Port Arthur, Tex., refinery. A substantial amount of the output will be used as charge to a recently completed cumene plant.

Crude capacity of the Regent Refining (Canada) Ltd. refinery at Port Credit, Ont., is being expanded from 20,000 to 26,000 bbl. daily. Completion is set for early next year. Next summer a $2,000,000 benzene and toluene plant, engineered by Universal Oil Products Co., will be placed in operation.

A petrochemical plant will be constructed near Geismar, La., by Monochem, Inc., a new company owned jointly by the Borden Co. and U. S. Rubber. The plant will convert natural gas into about 80 million pounds of acetylene and 150 million pounds of vinyl chloride monomer annually after completion in 1962.

Construction of a new 40-tray fractionator with auxiliary equipment is under way at the Houston plant of Dixie Chemical Co. The 80-ft. tower will have a capacity of 3,000 lb. per hour.

A $380,000 expansion and modernization program has been completed by Continental Oil Co. at its Ponca City, Okla., grease plant. The company finished a similar program for its compounding and packaging plant about 4 months ago.

The world's largest crude unit has been shut down for turnaround after 723 consecutive days of operation. It is Tidewater Oil Co.'s 150,000-bbl.-daily unit at Delaware City, Del., which processed 92,100,000 bbl. of crude from November 28, 1958, until last November 20, when it was taken off stream for 2 weeks of repair and maintenance.

Transco Picks Rate for Its New LPG Line

● Per-barrel maximum of 11.1 cents each 100 miles halves cost of rail haul.

TRANSCONTINENTAL Gas Pipe Line Co. has set a tentative—but maximum—rate for its projected new LPG line that will cut long-haul costs into the southeastern states by 50% and more.

The basic charge will not exceed 11.1 cents per barrel per 100 miles.

With this kind of rate advantage, Transco is preparing to advance its own money to start construction of the $63-million, 1,355-mile line from Houston to Danville, Va.

Balance of the money for the line will be obtained by loans from private investors who will hold the mortgage on the facilities.

The company expects to be installing the pipeline, pump stations and terminals as soon as weather permits next spring. Actually, construction already has started at a river crossing in Alabama. Transco, in laying a gas line across the Tombigbee River, also laid a 10-in. section for Trans-Southern Pipe Line Corp., the Transco subsidiary which will build and operate the new line.

Customers in Mississippi, Alabama, Georgia, North and South Carolina, and Virginia will be taking propane from the line before the 1961-62 winter season sets in (OGJ, Oct. 3, p. 66).

LUMBER STRIPS protect outer insulation of a 10-in. pipe being laid across Alabama's Tombigbee River for Transco's 1,355-mile LPG line.

The rate . . . Trans-Southern has decided on a linear type of tariff, as against the "curve" used by railroads.

This means that the rate is constant per 100-mile unit, regardless of the distance of the haul. With railroads the short haul costs more per unit.

The pipeline rate also carries a charge of 0.238 cent per gallon for terminaling — odorization, truck, or tank-car loading, and temporary storage. These services are not supplied by the railroads.

The effect of this is to give the pipeline a huge advantage over tank-car shipments for the shorter haul and a lesser advantage for the longer haul. But Trans-Southern is quoting figures that show the cost of movement from the extreme western end at Mont Belvieu near Houston to the extreme northeastern end at Danville is still about half that of the railroads.

Executive Vice President Robert L. Topper, Houston, says of the charge:

"We hope to do better than that, but the unknowns in design and construction preclude setting a final tariff at this time."

The company also is discussing joint tariffs with railroads and trucking firms for transshipment of propane from the terminals along the line to distributors.

Storage . . . Trans-Southern already has selected the site for a huge underground storage project near Atlanta.

To be built in a granite substructure, it will have a 1,000,000-bbl. capacity and rail-and-truck-loading facilities.

The company is now quoting tentatively an initial rate of 10 cents per barrel for storing product 50 days. For 210 days the rate is 1 cent per gallon.

In addition to the storage at Atlanta, Trans-Southern plans a 350,000-bbl. storage project in a salt dome near

Comparisons Point Up Pipeline's Savings

THE COST of moving LPG in Trans-Southern's new pipeline would be only about half that of hauling products in railway tank cars. Trans-Southern has fixed a tentative but maximum rate of 11.1 cents per barrel per 100 miles, and some comparative charges are given below. Pipeline rates are for terminal points on the line.

- Houston (Mont Belvieu) to Charlotte, N. C., 953.7 miles, 2.52 cents per gallon by pipeline and 5.029 cents by rail.
- Houston to Hattiesburg, Miss., 442 miles, 1.168 cents by pipeline and 3.008 cents by rail.
- Baton Rouge to Atlanta, 459.7 miles, 1.215 cents by pipeline and 3.243 cents by rail.

THINK how sensible it is to use this Gauge Valve and Connector instead of permanently installed pressure gauges. You need only one gauge for an entire lease. Eliminate valve breakage and repairs and insure correct pressure readings always with a single master gauge.

UNIBOLT "PRESSUREMATIC"

It's <u>both</u> a high-low safety and a Christmas tree wing valve

Since economy is the order of the day and safety can never be neglected in any economy, the UNIBOLT PRESSUREMATIC VALVE should be of double interest to production men.

Here is a valve that does the work of two valves yet costs little, if any, more than a good high pressure valve.

The UNIBOLT PRESSUREMATIC VALVE combines all of the time-tested and proven features of the Unibolt Adjustable Wing Valve with a novel automatic actuating accessory. The valve closes instantly when a pre-determined pressure balance across the seat is disturbed. The actuating mechanism consists of a small piston which is exposed to well pressure and a larger piston which is exposed to flowline pressure. A broken flowline or open valve, for example, in the production system, would lower the flowline pressure and thus instantly close the valve. Once closed, the valve may be easily opened and set manually for automatic operation. The downstream or low pressure line may be tapped at any remote point and thus embrace any desired portion of a gathering and treating system. Offshore and other remotely controlled wells could be shut in automatically in case of fire, ship collision, etc. The unique design lends itself to many such applications.

Send for literature or contact your nearest UNIBOLT sales representative.

The regular UNIBOLT Adjustable Wing Valve can be readily converted to "Pressurematic" by replacing the stem/bonnet assembly with the Pressurematic unit.

UNIBOLT

THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas

Eunice, La. Also there is privately owned underground storage at the end of spur lines at Hattiesburg, Miss., and Demopolis, Ala.

The market . . . Just how big is the market that Trans-Southern is shooting for?

The size depends on so many factors that the company hesitates to give a figure. Studies currently are under way.

But Trans-Southern's President E. Clyde McGraw, who also heads Transco, believes producers will use the common carrier pipeline to move at least 16,000,000 bbl. of propane from Texas and Louisiana sources to terminal points eastward in the first year.

Trans-Southern holds letters of intent from propane suppliers and producers, both majors and independents, from the Houston ship channel to Baton Rouge.

The new line will have a capacity of 60,000 bbl. daily, making it easy to handle a 16,000,000-bbl. annual delivery. This capacity could be increased to as much as 100,000 bbl. daily by adding pumping facilities, but the company does not see this much business for some years.

Construction . . . Since Trans-Southern's line will parallel the gas line of the parent Transco for most of the distance, the job of obtaining right-of-way is not a big one. About 10% of the right-of-way for the new line must be purchased, and this is now being done.

Trans-Southern is negotiating contracts for the design and engineering of pump stations and terminals and is doing its own design and engineering for the pipeline. Contracts for laying the line will be submitted for bids shortly after the first of the year.

The company has made all its pipe commitments for the line to avoid any construction delay next year.

What's ahead . . . Does Transco plan to extend the LPG line eventually into the New York area along its present gas pipeline right-of-way?

This, according to McGraw, is not in the cards at this time because the competitive advantage drops as the line grows longer and approaches the larger refinery areas of the northeast.

But the basic principle of moving propane by pipeline is a sound one, and Transco sees no reason why the idea shouldn't spread. The Trans-Southern line will be the second ever built specifically to move LPG. The first, a $67 million project of Mid-America Pipeline Co., went into operation December 1.

watching WASHINGTON

Clyde La Motte

• Oil policies are brewing at governmental agencies . . .

DON'T OVERLOOK or underrate current developments in various governmental agencies. Patterns will continue to be shaped up even though a new Administration will take over in January.

Here are some key areas to watch in the weeks ahead:

. . . Oil import rule changes. Interior's planned modification of crude-import rules will not end consideration of further revisions in the program. However, a major overhaul will not affect the upcoming January-June allocation period.

Before subsequent changes are made, it is likely that public hearings will be held on such issues as a switch to a crude-demand basis for determining over-all import levels and a switch to refinery runs as the sole basis for individual quotas.

Under the new Administration, the entire control program may undergo a broad study next year as part of the general look at the nation's energy picture which President-elect Kennedy has proposed.

Right now, some top import officials are leaning heavily to the producer-backed plan to tie import levels to domestic-crude demand. And the elimination of the historical basis for individual quotas is likely, too, although this may be done on a gradual scale.

Before major changes are made, it is quite possible that the Office of Civil and Defense Mobilization may get into the picture. One reason: To avoid court challenges which some companies have threatened to make if import levels are reduced without OCDM certification that such reductions are necessary for national defense and public welfare.

. . . Natural gas regulation. The Federal Power Commission is working hard to get the area-pricing approach off the ground. The commission is acutely aware that unless it moves promptly, this approach will bog down as hopelessly as the old rate-base method.

Now that the commission has turned down requests for a rehearing of the Phillips case decision, here is what to look for:

The commission will set hearings on new area boundaries. The purpose is to make area boundaries follow natural field and market boundaries rather than following state, county, or district lines.

FPC will also set the stage for producer groups and others to present evidence supporting proposed changes in area-price ceilings.

And the FPC hopes to be able to devise an acceptable plan for eliminating the differences between price ceilings for new gas sales and for old contract prices.

. . . Tankers. The staff at the Office of Civil and Defense Mobilization has buttoned up its recommendations on a plea by an independent tanker group to require that at least 50% of oil imports be hauled in U. S.-flag tankers.

A top-level decision is expected any day now. Prospect: Rejection of the tanker group's proposal.

. . . Asphaltic crudes. OCDM still hasn't decided whether to exempt the asphaltic content of crude from import controls. It may continue to wait until Interior or the Administration decides on major import-rule changes. Prospect: The exemption will be granted, partly to mollify importers who face import cuts and partly to avoid any charges that restrictions on asphaltic-crude imports might hike the cost of highway building.

. . . . . Price surveillance. OCDM has started receiving the first of the periodic reports required on residual fuel oil prices. Once it has tabulated and evaluated these reports, OCDM will have to decide whether it needs to do anything about such prices. Prospect: No outright price-control action.

. . . Marketing. Rep. James Roosevelt (D.-Calif.) will issue a report soon which will be sharply critical of "coercion" of service-station operators by major suppliers. Prospect: A minority committee report which will criticize Roosevelt.

Cost-saving standardization available in

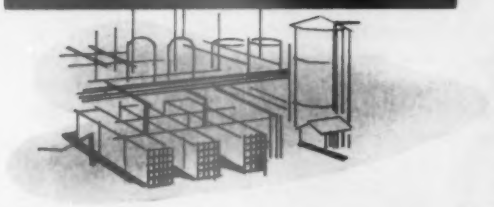
scores of new duties with **NEW**

MULTI-FINTUBE EXCHANGERS

Patent Pending

Now, many additional duties can be handled with hairpin type heat exchangers economically and efficiently. A new multi-fintube section developed by Brown thermal engineers incorporates a bundle of finned tubes within each shell. Heat transfer capacity is sharply increased to the point where one new multi-fintube section does the work of up to four conventional single fintube sections. Brown multi-fintube units handle conventional duties at much lower cost. Due to their increased fin efficiency the multi-fintube sections have increased the scope of application for this type of heat exchanger equipment. Typical examples of applications are light hydrocarbon exchangers, condensers, coolers, and water to water exchangers.

Write for Bulletin 111 on Brown's new multi-fintube units. Brown Fintube Company, Dept. OG-11, 300 Huron Street, Elyria, Ohio.



BROWN STANDARDIZATION REDUCES COSTS

- **LOWER INSTALLATION COSTS**—Only one type unit to install.
- **NO OBSOLESCENCE**—As duties change, units are used in new banks.
- **EASIER MAINTENANCE**—Only one type to service.
- **LOW PARTS COSTS**—Only four parts for hundreds of exchangers.
- **NO DOWNTIME**—Valving permits any unit to be serviced while others operate.
- **STANDBYS READILY AVAILABLE**—One unit serves as a standby.
- **IMMEDIATE DELIVERY**—From U.S.A., Canada, England, France, Germany, Japan and Mexico.

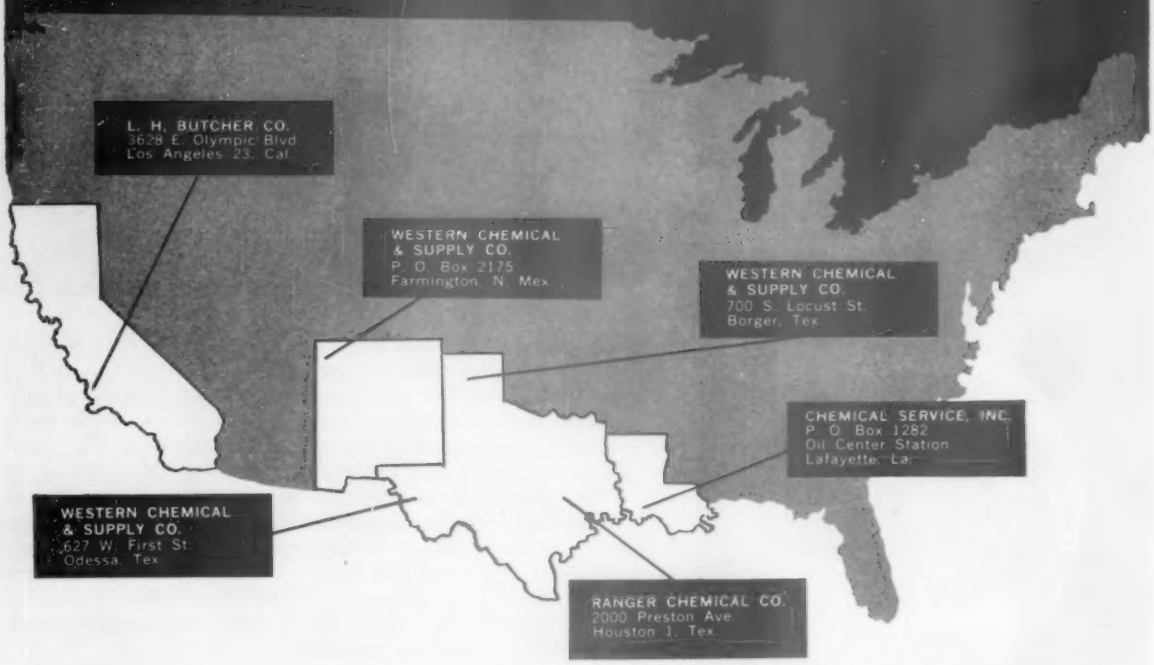
HEAT EXCHANGE SURFACE
BROWN FINTUBE
HEAT TRANSFER PRODUCTS

BROWN FINTUBE

SYMBOL OF EFFICIENCY IN HEAT TRANSFER PRODUCTS

For the petroleum industry...

ethylene glycols
ethanolamines
propylene glycols



To give you immediate deliveries, our distributors in the Southwest maintain local bulk and drum stocks of ethylene glycols, ethanolamines and propylene glycols for petroleum processing. These products are also stocked by distributors in other areas (with carload and bulk shipments being made from our Brandenburg, Ky., plant). For the name of your nearest distributor in these other areas, samples and technical data sheets, see your Olin Mathieson representative or write for complete information.

Olin Mathieson

Chemicals Division, 745 Fifth Ave., New York 22, N. Y.

Ethylene Oxide • Ethylene Glycols • Polyethylene Glycols • Propylene Oxide • Propylene Glycols • Polypropylene Glycols • Ethanolamines • Glycol Ethers • Surfactants • Ethylene Dichloride • Propylene Dichloride 8238

Wildcat Spudded in Alaskan Tidelands

ALASKA'S search for oil has moved offshore.

Standard Oil Co. of California has spudded the first test it will drill on acreage held jointly with Richfield Oil Corp. in the Cook Inlet basin. The well, being whipstocked from a onshore location, will be bottomed under the waters of the inlet.

The wildcat, designated the Falls Creek 1, was drilling ahead last week at an unreported depth. It is a no-dope hole since it is the first test on this jointly held acreage.

Surface location is Lot 3-1n-12w, but the operator has not released the projected depth nor the bottom-hole location. Coastal Drilling Co., Bakersfield, is contractor on the well.

To the north Standard of California and Richfield are developing Alaska's only commercial oil field. The companies recently completed their fifteenth well in Swanson River field.

The latest completion was made in the Soldotna Creek unit section of the field and is one of the best wells completed to date. The well flowed at a rate of 1,000 bbl. daily from about 10,815 ft., the total depth of the well.

Crude recently started moving out of Swanson River field through a new pipeline. The oil is being tankered to California refineries.

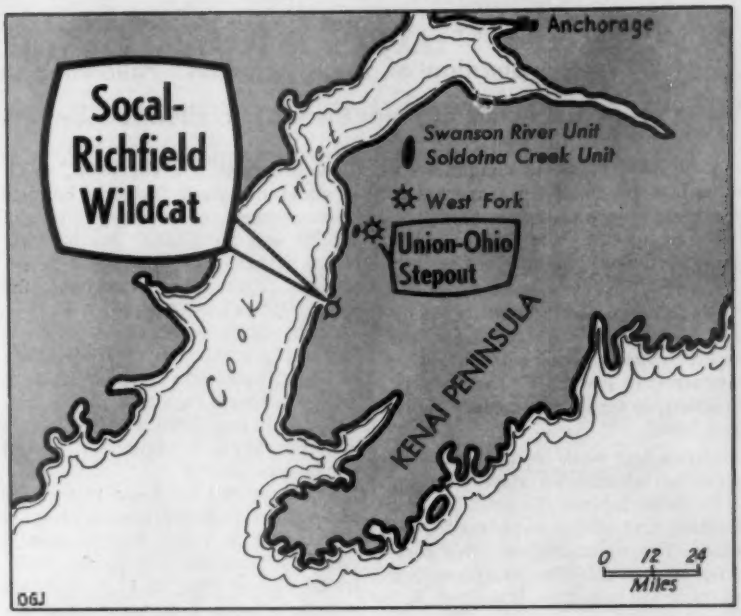
Gas field extended . . . In another significant exploratory development on the Kenai Peninsula, Union Oil Co. and Ohio Oil Co. have moved production 2 miles east in the gas field they are developing on the Kenai unit.

Production proved up in the field to date has been on a 2-mile north-south trend. The new well, Kenai unit 14-4, is almost 2 miles directly east of the discovery. The other wells are north of the discovery.

The 14-4 was completed flowing at the rate of 4,130 M.c.f. daily through a ⅜-in. choke. The flow was from a 9-ft. interval at 4,310-19 ft. with a tubing pressure of 1,200 lb. The location is Sec. 4-4n-11w.

Union, operator on the lease, has staked location for a fifth well in Section 19, about 2¼ miles south and slightly east of the discovery well. This well will be spudded in mid-December.

Union and Ohio have proved up a sizable gas reserve on their unit. Reserves were sufficient from the first three wells to start construction of a gas line to serve Anchorage. The line is under construction and completion is expected in the spring.



Alaska Test Abandoned

A FIVE-COMPANY group has abandoned its fourth wildcat on the southern coast of Alaska, but plans to continue its search on a million-acre lease held in the area.

Colorado Oil & Gas Corp., operator, took the 1 Dangerous River to 8,634 ft. before abandoning the test as a dry hole. The Dangerous River well is about 15 miles south of Yakutat Bay, where the group drilled three dry holes.

Next year the group plans to drill several shallow holes and do more seismic work between Fairweather and Yakutat. Several gas shows turned up in the Yakutat drilling.

Others in the group are Continental Oil Co., Frankfort Oil & Gas Co., British Petroleum Co., Ltd., and Sinclair Oil & Gas Co.

Payment Frees LPG Patents

- **Strings taken off underground storage of LPG, following $1.5 million payment to Sid Richardson interests.**

TWO United States and Canadian patents dealing with underground storage of LPG and hydrocarbons in salt formations have been dedicated to public use.

Storage companies now are freed from patent provisions under which the Sid Richardson interests sought to collect one-eighth cent a gallon for all LPG withdrawn from salt caverns.

A joint announcement by executors of the Richardson estate and Pan American Petroleum Corp., Skelly Oil Co., Socony Mobil Oil Co., Inc., and Warren Petroleum Corp. last week revealed assignment of patent rights to Ira Butler, a Fort Worth attorney representing the oil companies. He in turn formally dedicated the patents to public use.

At present, the capacity of salt-cavern storage facilities in use or under construction in the U. S. and Canada totals about 50,000,000 bbl. (OGJ, Nov. 28, p. 85).

The Richardson interests first used commercial salt storage for products near Kermit, Tex., in August 1950. The patents were reissued in May 1957. (OGJ, Feb. 2, 1959, p. 58).

Two federal court suits which named Pan American and Skelly were filed in the northern Texas district federal court at Amarillo. Later Socony Mobil and Warren joined the first two companies as defendants. A $1,500,000 out-of-court settlement of the cases was announced last August. About 100 companies contributed to the financial settlement.

Socony Maps Big Order for Its Big Computer

• New 7090 will get the job of analyzing complex problems in a world-wide coordination of firm's activities. Following shakedown runs the machine is expected to point the way to cheaper, better oil operations.

A BIG STEP toward computer coordination of supply, transportation, manufacturing, and distribution operations on a world-wide basis has been taken by Socony Mobil Oil Co., Inc.

The key to machine solution of these complex interrelated problems is a new IBM 7090 computer, the largest capacity machine available commercially (see p. 73 for story on Standard of California's newly delivered 7090).

Socony last week issued a progress report on shakedown runs with the 7090, demonstrated the solution of a problem, and spelled out plans for the future. The significance of this computer, used in conjunction with several others in the company, is this:

"The 7090 will show us how to develop the most economical means of selecting the type and source of crude oil best suited for each refinery. It will help us decide what products to make, and how much of them, for each market. And then it will help show the lowest-cost way to get the products to market."

This is the summation of Dr. Julius Aronofsky, manager of Socony's computer center in New York.

In addition, according to George F. James, director and senior vice president for planning and finance:

"The computer will be a key tool in solving complex accounting, engineering, and management problems of Socony Mobil's world-wide activities. Applications include areas of inventory control, forecasting, general accounting, and research."

7090 program . . . The 7090, which is doing the work formerly handled by two other computers (a 704 and a 650) and for $4,000 less monthly rental, is being set up to analyze integrated operations throughout the U. S. (OGJ, Oct. 24, p. 67).

More and more oil firms are going in for big computers that previously had been limited to defense industries and government facilities.

Socony's new 7090 was installed in the company's headquarters several weeks ago.

The first step has been to transfer the light-products-distribution program for one of Socony's four marketing divisions from the 704 to the 7090. By the end of 1961, all U. S. divisions will have been programed. And international operations will come next, perhaps requiring still more computer capacity.

When light-products distribution has been taken care of, lube-oil and other products problems will be added to the 7090's repertoire.

The program for each division is based on a forecast of requirements for each Socony customer. There are 4,000 customers in the Midwest division, already set for computer handling, and 10,000 for the whole U. S. with a forecast sheet for each one.

The data on each sheet are transferred to five punch cards, which are then converted to magnetic tape. Each market division is on a separate reel of tape.

When these tapes are run through the 7090, the machine checks its memory of models for sources of supply, transportation alternatives, refinery capacity, and distribution alternatives, figuring the costs of a myriad of combinations.

It comes up with a printed guide for:

. . . Sources for the best combination of crudes to meet marketing needs.

. . . Cheapest means of transporting the crude to refineries.

. . . The refinery or refineries which can most economically manufacture the products, and the yield patterns which would be best.

. . . Cheapest transportation and distribution facilities to move products from refinery to customer.

Frequency of analyses . . . Such analyses are made annually and quarterly.

Once a program has been set up, maintaining it is not a major job. If a forecast has been changed, card data could be changed in time to make another computer analysis the same day, Dr. Aronofsky estimated.

Besides improving efficiency of operations, thereby cutting over-all costs, machine solution of problems is expected to put management in a position to react more quickly and adjust operations to meet conditions.

Computer speed . . . This multi-purpose computer, designed especially for scientific and engineering analyses but capable of handling accounting problems also, is six times as fast as the largest machine formerly leased by Socony.

It took 10 hours for the 704 to solve marketing problems for a division of 4,000 customers. The 7090 will be able to handle all U. S. divisions in the same amount of time, and perhaps faster as more experience is gained.

Communications network . . . The 7090 is one of nine computers located in various Socony offices over the world. Ten others, all of smaller capacity, have been ordered.

Eventually, key cities may be linked by microwave radio for data transmission from one computer center to another. This is a possibility some 5 years from now as Socony moves deeper into computer coordination of operations.

Mecom Ready to Spud "Deepest" Well

JOHN R. MECOM completed dredging work last week in preparation for spudding a South Louisiana well that is projected to 26,000 ft.—the deepest hole ever drilled.

Mecom announced plans for the well 14 months ago (OGJ, Oct. 5, 1959, p. 101). It will be located 8,000 ft. east of a one time depth record-holder, the 1 LL&E Humble "L," drilled to 22,570 ft. in 1955 and later produced at 20,548 ft. The record depth is a 25,340-ft. dry hole, drilled in Pecos County in 1958 by Phillips Petroleum Co.

Mecom's new well will be located 4 miles south of Port Sulphur on the west side of the Mississippi River in delta swampland. Spot location is 37-19s-27e, Plaquemines Parish. The well will be named the U. S. Oil of Louisiana 1 Unit "S" Louisiana Land & Exploration Co., State Lease 2435 and 2414.

The well will be drilled through Homeplace field. Mecom's steam drilling barge will be used.

Sharing in the well cost will be Mobil Oil Co., a part-owner of the lease. Mecom, a Houston independent, operates in Louisiana under the name of U. S. Oil Co. of Louisiana.

Kuwait Hands Rich Offshore Prize to Shell

● Company pays $84 million bonus, but sticks to 50-50 profit split. The deal also grants Kuwait a 20% share in a development firm.

ROYAL Dutch-Shell last week walked away with the world's prize oil exploration plum by offering Kuwait an $84 million bonus plus 20% participation in a new company to develop the little country's offshore acreage in the Persian Gulf.

The Shell offer, announced in a radio speech by the ruling shaikh, calls for the traditional 50-50 split in the profits of any oil found and produced. There has been widespread speculation that any successful bidder for the choice acreage would have to offer Kuwait more than half the profits to get the concession.

The underwater territory off Kuwait is easily the choicest prospective oil area in the world today. It is regarded as semiproved oil land in spite of the fact that it has never been touched with a drill bit.

The Kuwait acreage lies just to the north of the Saudi Arabia-Kuwait Neutral Zone offshore tract now being developed by a Japanese company.

The Japanese got that concession by offering both Saudi Arabia and Kuwait more than a 50% share of the profits. The first Japanese well was a producer good for at least 6,000 bbl. daily. Since that time the Japanese have drilled four more producers.

It is regarded as highly significant that Shell was able to obtain the concession without breaking the 50-50 profit sharing pattern. If Shell had departed from the pattern, it would have been the first major oil company to do so.

The Italians, the Japanese, and Pan American International, a newcomer in the Middle East, have all done so. The deals made by these companies made it appear that the equal profit sharing principle was crumbling. The new Shell concession may serve to hold the line against further erosion of the tradition.

Markets ready . . . The Royal Dutch-Shell group is the only major oil company in the world today which really needs more Middle East oil. The fact that Shell can find markets for any offshore Kuwait production it may strike undoubtedly played a part in the Kuwait decision to award the concession. Shell has interests in Iranian and Iraqi oil, but not on the same scale as the other major companies of the world.

The major part of Middle East oil marketed throughout the world by Shell already comes from Kuwait, but the company is forced to buy it from Gulf in order to have an adequate supply. Shell is now lifting between 550,000 and 600,000 bbl. of Gulf oil in Kuwait under a long term contract.

Shell's need for additional crude sources in the Middle East is in direct contrast to the position of most of the company's competitors in the bidding for the offshore acreage. All other bidders, except for Jersey Standard, would have to find markets for any Kuwait offshore oil they might develop.

Jersey has a plentiful and flexible supply of Middle East oil to meet its needs. The other bidders like the Japanese, the Italians, and smaller American companies like Pan American, Phillips, Atlantic, Cities Service, and Continental would have to fight for market outlets for the oil.

The 20% participation offered Kuwait in a Shell company to explore and produce Persian Gulf oil took many observers by surprise. Most Middle East oil men expected Kuwait to demand a bigger share in any company granted the concession.

Under the terms of the Shell offer accepted last week by Kuwait, this 20% interest in the company can be held directly by the Kuwait Government or by the new national oil company which was formed just recently.

The Shell offshore concession will include all of Kuwait's territorial waters in the Persian Gulf beyond the 6 nautical-mile strip along the coast which is a part of Kuwait Oil Co.'s concession.

Oasis Oil Chalks Up Another Libyan Strike

• New well, near an earlier discovery of the company, tests 4,440 bbl. a day. Plans are being shaped for two stepouts.

OASIS OIL has hit pay dirt again in Libya.

The Libyan Petroleum Commission said the company's A2 well in Block 59 tested 4,440 bbl. daily from 6,600 ft. The crude is 35°-gravity.

The well is about 15 miles north of Oasis B1 discovery made earlier this year. It is about 35 miles south-southeast of Esso Libya's prolific Zelten field. Concession 59 lies in petroleum zone 2 in Cyrenaica.

Preparations are under way for two stepouts. But the locations in relation to the discoveries were not disclosed.

The discovery is the first find since Oasis' corporate setup was revised and put under the direction of a new producing and transportation company. This is Oasis Oil Co. of Libya, Inc., which serves as operator for Amerada Petroleum Corp. of Libya, Continental Oil Co. of Libya, and Ohio Oil International of Libya.

The new company took the name of the wholly owned subsidiary of Ohio Oil, which had acted as operator on exploration (OGJ, May 30, p. 73).

The proximity to Zelten may mean that Oasis will be able to move its crude via a feeder line to the 100-

mile 30-in. pipeline which Esso is building to the Mediterranean coast at Marsa el Brega.

Esso will be able to move as much as 100,000 bbl. daily of its own production by gravity flow. If this did not leave enough spare capacity to handle Oasis output, throughput could be greatly increased by the addition of pumping stations.

Oasis brought in its B1-59 as a 1,500-bbl.-daily well on preliminary tests in February. There were widespread reports at the time that the well's discovery eventually would have a much better potential (OGJ, Mar. 7, p. 78).

Since then Oasis has had three of its 12 rigs in Libya drilling in the 15,000-sq.-mile block. One outfit has been drilling evaluation wells in the B-1 area, while two have been drilling wildcats, including A2.

Other areas . . . Oasis is also pressing ahead on its Dahra area in Block 32, where four rigs are drilling development wells. The company is planning a big-inch pipeline to the Mediterranean coast from the area. The line will be at least 30-in., with some sections possibly as large as 42 inches.

A spur to the system is planned from the Esso-Libyan American Mabruk field on an adjoining block west.

Two of the Dahra-field wells are among the best in Libya. F-9, in the southeast corner of the concession, was completed at 11,500 bbl. daily, the third biggest well in the country. Only Esso's first two Zelten wells are bigger.

Jersey Firm May Let Indians Buy Stock

THE Jersey Standard company taking over Stanvac operations in India may offer 40% of its share capital to the Indian public.

Reports from New Delhi say that Esso Standard Eastern may gradually convert its marketing organization to a rupee company as part of a deal for concession rights in the Rajasthan region of Northwest India. Another part of the same agreement may include government permission to build lubricating oil and petrochemical plants already planned by Stanvac.

Stanvac this year wound up a 6-year exploration program in the Bengal basin after spending $14.5 million and drilling 10 dry holes. This cost does not include the contribution by the government, which held 25% interest in the project.

Esso Eastern will take over the Indian operations as part of the split-up of Stanvac by Jersey and Socony Mobil. Within 3 years the parent companies will divide most of the jointly held business interests in the Far East, Australia, and parts of Africa. In Japan, the dissolution will be carried out within 5 years (OGJ, Nov. 21, p. 143).

Duty protection is off . . . Stanvac, in another move, has relinquished the duty protection on all products covered in its 10-year-old refinery agreement with the government. The move will cost the company about $2.1 million a year.

The company gave up the duty protection under heavy pressure from the government. India complained that Stanvac used the protection to quote prices for bulk purchases of high-speed diesel oil that were lower than those of the state-owned Indian Oil Co., which is trying to sell Russian diesel oil.

Burmah-Shell gave up duty protection on all products last year. Stanvac and Caltex surrendered protection on gasoline 3 years ago. But the latest Stanvac concession to the government may force Caltex to follow.

Oil India debentures . . . Another company also is reported considering a major financial move. This is Oil India Private, Ltd., owned two-thirds by Burmah Oil Co. and one-third by the government.

Oil India plans to float a $52 5 million debenture issue in January to finance the 720-mile 16-in. and 14-in. pipeline from Nahorkatiya field to Barauni. This issue will be the biggest of its kind in India, and the 7% interest will be the highest rate ever offered to the public.

The state bank of India is understood to favor making some of the debentures convertible at fixed prices.

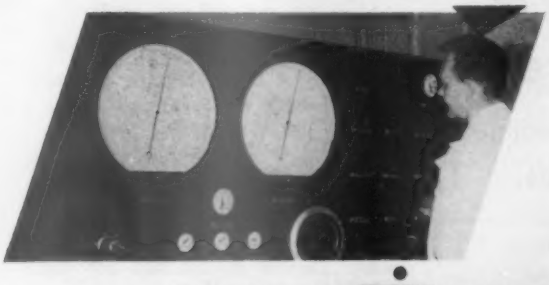
Burmah Oil, on its part, has suggested a net profit of 15 rupees per ton, or about 47 cents per barrel, on its producing and pipeline operations.

The government thinks this margin is too high.

RESULTS START HERE!

What are the things you expect everytime you specify *Halliburton* for your fracturing operation? An experienced crew working with the most modern fracturing equipment ... the latest fracturing materials ... the *best* from a wide selection of fracturing techniques to help obtain a successful job. You may be familiar with these ... but what about the wealth of experience, facilities and activity of the research men who make up the Halliburton team behind the fracturing crew? These advantages are yours, too ... when you specify Halliburton:

CHEMICAL R & D LABORATORIES ... the most complete of any oil field service company in the world. Here, skilled research chemists and engineers seek answers to problems such as – "The best cementing practice for improving formation fracturing" ... "The most applicable fluids for a formation." A constant research program is maintained for developing new and improved fracturing fluids, additives and techniques. They also search out information for you by making chemical and physical analysis of cores and cuttings ... utilizing X-ray diffraction and other techniques.



M R D (Mechanical Research and Development) ... Here, millions of dollars and thousands of man hours are invested in improving current fracturing equipment ... and developing completely new ideas to do a job better – faster – more economically than ever before.

EQUIPMENT DESIGN / TOOL DESIGN ... Here, complex equipment is engineered to meet specific field requirements. One section is constantly improving fracturing equipment efficiency and developing new equipment ideas. The other section designs special tools and other down-hole equipment to help obtain more successful fracturing jobs.

DATA PROCESSING ... This newest member of the fracturing team helps speed data precalculations ... charts information ... performs a multitude of tasks with lightning speed to determine the best engineering combinations for optimum fracturing conditions and results. The rows of processing equipment and giant electronic memory units used here are the largest, most useful facilities of this type ever to be employed by an oilfield service company.

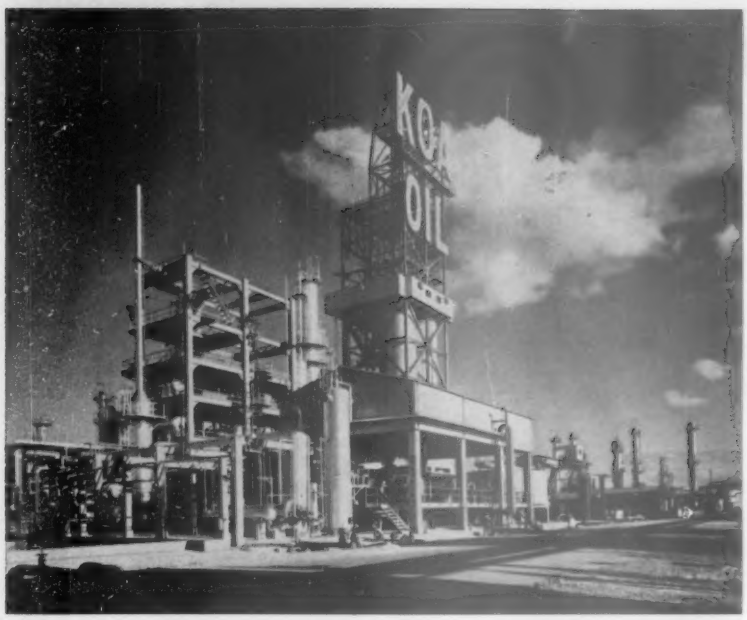
BE SURE YOU GET THESE PREMIUM BENEFITS ON YOUR NEXT FRACTURING JOB! ALWAYS CALL HALLIBURTON!

Visual and permanent records of your fracturing operation on-the-spot ... the HALLIBURTON FRACOMETER! Ask about it.

HALLIBURTON
FRACTURING SERVICES

HALLIBURTON COMPANY • DUNCAN, OKLAHOMA

FIRST ... AND STILL FOREMOST ... IN FORMATION FRACTURING



Japan's New Coker on Stream

• Big unit, first of its kind in the country, is making low-sulfur coke from hard-to-handle Sumatran crude.

JAPAN'S first delayed coker has been put on stream at Koa Oil's 35,700-bbl. refinery at Marifu, Yamaguchi Prefecture.

The 5,500-bbl. unit will turn out 60,000 tons per year of low-sulfur coke from Duri crude, produced by Caltex in Central Sumatra. Cost of building the UOP low-pressure unit was $2.2 million. It was built out of an idle 3,500-bbl. thermal-cracking unit to which a coking drum and decoking facilities were added.

Koa Oil has coupled the coker with a 5,500-bbl. UOP cat cracker completed in April. This permits runs of 10,000 bbl. daily of 22°-gravity Duri crude, which has a yield of only 6% gasoline and 13% distillate.

Duri crude cannot readily be handled in a conventional refinery. But the combination coking and cat-cracking setup improves refinery economics by reducing residual fuel oil output, and by a reduction in corrosion and a saving in an investment for a desulfurizer. Duri crude has only 0.18% sulfur.

The coker is expected to save about $1.5 million per year, or $25 per ton on an f.o.b. basis, in foreign exchange. This year the country will import about 300,000 tons, of which two-thirds will be raw coke, and one-third calcined coke. The government has allocated $9 million for petroleum coke out of $240 million allowed for oil imports in the October 1960-March 1961 period.

NEW COKER'S YIELDS

Feed: Duri Vacuum Residual

Products:

C_4 and lighter	9% (wt.)
C_5/400	20% (vol.)
Gas oil-cat cracker feed	55% (vol.)
Coke-0.35% sulfur	22% (wt.)

Major consumers of petroleum coke are the calcium-carbide, town-gas, iron-and-steel, and ceramic industries.

Industrial Centers

...mapped by Japanese to streamline manufacturing.

THE JAPANESE Government is developing long-range plans for a series of industrial complexes, each of which will include refining, petrochemical, iron-and-steel-manufacturing, and power-generating facilities.

The Ministry of International Trade and Industry wants to promote at least five of the industrial clusters, known in Japan as "combinations," within 10 years. The combinations will serve as the raw-materials supplier for adjacent heavy manufacturing and chemical industries.

To qualify for entry into a combination, a secondary company must fit into the supply-demand picture for raw materials or products, and be heavily dependent on refining, petrochemical, iron and steel, and thermal-power industries.

The ministry plans to locate the complexes on sites where there is a bay with water depth of over 48 ft. in order to accommodate heavy tankers.

Thailand Refinery

. . . gets approval after long government study.

AFTER considering a variety of refining projects for years, the Thai Government has decided to build a relatively small 5,000-bbl plant near Bangkok.

Most of the refinery equipment will be supplied from France. Engineering services will be supplied by Hydrocarbon Research, Inc., of New York, through a contract with a French firm, Commentry-Oissel Cie. The work will be carried out by Hydrocarbon's French affiliate, Hydrocarbon Engineering, S.a.r.l.

The government still is considering a second project for a 28,000-bbl. plant. Despite its contract for the 5,000-bbl. plant, bids also have been asked for construction of the larger refinery.

The project would be the successor to a deal from which Indiana Standard withdrew. One of the reasons was Thailand's insistence that the plant be turned back to the government after 10 years.

Thailand's present demand of more than 20,000 bbl. daily is supplied entirely by product imports. Marketers are Stanvac, Shell, and Caltex.

Pemex Slates New Pipeline

PEMEX will start construction next year on a 500-mile products pipeline from Minatitlan to Mexico City.

Pascual Gutierrez Roldan, head of the Mexican oil agency, said the $24-million line will be a multiple products carrier with a capacity of 25,000 bbl. daily. The system will move products northward from Pemex's 85,000-bbl. Minatitlan refinery.

The line will be built along the right-of-way of a 24-in. natural gas system nearing completion between Ciudad Pemex, State of Tabasco, and Mexico City. Construction of the parallel products line will take an estimated 12 to 18 months.

World Crude Peak Set

- Middle East production surges to new height and pushes free-world output to record.

RECORD output in the Middle East pushed free-world crude production to a new all time high in September.

All four big Persian Gulf producing countries produced more than a million barrels daily in the same month for the first time. Saudi Arabia, Iran, and Iraq had their best individual producing months in history.

Russia firmly established itself as the world's second ranking producing country, behind the U. S., with an output of 38.3 million metric tons or about 3,027,000 bbl. daily, during the third quarter. Production in the first 9 months of the year was 109 million metric tons, or 2,890,500 bbl. daily. This is a gain of 14% over the same period the preceding year.

TREND OVER THE LAST YEAR

	Western Hemisphere less U. S.	Middle East	Total free world outside U. S.
1959			
September	3,886.4	4,635.4	9,440.6
October	4,069.6	4,699.2	9,629.8
November	4,123.2	4,820.7	9,877.9
December	4,218.5	4,682.0	9,861.5
1960			
January	4,316.5	5,065.3	10,334.7
February	4,389.5	4,986.5	10,313.2
March	4,156.4	5,146.3	10,346.8
April	4,069.5	4,925.5	10,055.1
May	4,317.4	5,286.2	10,680.2
June	4,285.4	5,164.5	10,568.2
July	4,214.2	5,103.5	10,448.3
August	4,320.1	5,146.8	10,602.5
September	4,311.3	5,500.2	10,941.3

World-Wide Crude Production: Daily average in thousands of barrels

Country—	Sept. 1960	August 1960	Sept. 1959
Western Hemisphere			
Argentina	186.7	186.7	122.5
Bolivia	8.4	8.4	8.9
Brazil	76.0	76.0	72.3
Canada	515.0	525.0	548.7
Chile	19.0	19.0	18.5
Colombia	145.1	111.4	149.9
Cuba	0.2	0.2	0.5
Ecuador	7.8	7.8	7.4
Mexico	284.1	284.1	262.3
Peru	52.2	52.2	47.2
Trinidad	121.7	121.3	114.6
Venezuela	2,895.1	2,928.0	2,533.6
Total	4,311.3	4,320.1	3,886.4
Europe			
Austria	45.1	45.2	46.0
France	41.1	41.2	33.9
West Germany	107.3	107.0	100.4
Italy	41.2	41.2	31.7
Netherlands	37.6	37.7	33.7
United Kingdom	1.7	1.7	1.8
Yugoslavia	33.0	23.2	12.1
Total	307.0	297.2	259.6
Middle East			
Bahrain	45.1	45.1	45.2
Iran*	1,112.0	1,048.0	1,011.0
Iraq†	1,046.8	985.9	915.8
Israel	2.0	2.0	2.0
Kuwait	1,729.1	1,589.9	1,298.3
Neutral Zone	135.0	135.0	118.6
Qatar	174.7	174.8	181.1
Saudi Arabia	1,249.1	1,159.7	1,055.8
Turkey	6.4	6.4	7.6
Total	5,500.2	5,146.8	4,635.4

Country—	Sept. 1960	August 1960	Sept. 1959
Other Asia			
British Borneo	93.1	93.1	111.3
Burma	10.5	10.5	11.0
India	8.5	8.5	8.5
Indonesia	396.0	423.8	394.5
Japan	9.9	10.0	8.2
New Guinea	4.5	4.5	4.5
Pakistan	5.9	5.9	6.5
Total	528.4	556.3	544.5
Africa			
Algeria	195.1	178.8	21.3
Angola	1.0	1.0	1.0
Egypt	60.1	64.4	62.1
Gabon	16.8	16.5	16.2
Morocco	2.1	2.1	2.1
Nigeria	19.3	19.3	12.0
Total	294.4	282.1	114.7
Free World			
Foreign	10,941.3	10,602.5	9,440.6
United States	6,971.0	6,940.0	6,857.0
Total	17,912.3	17,542.5	16,297.6
Communist Countries in Soviet Orbit			
Romania	231.0	231.0	235.0
Russia	3,027.0	3,027.0	2,688.0
Other Communist	100.0	100.0	100.0
Total	3,358.0	3,358.0	3,023.0
WORLD TOTAL	**21,270.3**	**20,900.5**	**19,320.6**

Figures are from reliable industry reports or government sources. Estimates are made where complete reports are lacking. *Includes estimated 6,000 bbl. daily from Naft-i-Shah field not operated by Consortium companies. †Includes estimated 3,500 bbl. daily from Naft Khaneh field, operated by Iraq Government.

Fourteen years of research on 23 test wells have produced startling support for the theory that . . .

Electrically balanced well structures can relieve production problems

BY V. C. CRITES AND M. K. FJELDSTED

ALL OIL WELLS have an electrical potential.

If an oil well has an offset, the second well will have a potential.

Two wells, drilled into the same reservoir, and connected to a common manifold or tank make an electrolytic cell. And then the trouble begins.

We applied the methods described here because we believe that the primary cause of corrosion is the electrical and electrochemical phenomena associated with the normal development of any oil field. Test installations show that many production problems such as corrosion, wax deposits, and scale are directly related to the normal electrical charge on the oil-well structure.

Basic Theory

Identical samples cut from the same stock of any ferrous material will show a potential difference when immersed in an electrolyte. Should they be connected either by a second electrolytic bath or by a solid conductor or both, current will flow and the anodic sample will corrode. As the area of the anodic sample in contact with the electrolyte is increased, so the current density is increased.

Mechanical stresses also raise the potential of the metal structure.

In any oil field there is always a difference in the amount of pipe in contact with conductive strata. Variations in surface elevation, or dips in the formation could account for this difference. Different sizes, lengths, and grades of pipe are used in different wells and in some fields the wells are produced from several different zones.

Any one or all of these variable factors create a potential difference between well structures. This potential difference is the primary cause of current flow between wells and leads to corrosion and many other production problems.

This is not another cathodic-protection application

One of the largest and most obvious production expenses is for repair of corrosion damage in oil wells. Another less apparent expense is production losses attributed to wells becoming obstructed. We know that corrosion, scale, and wax deposition are correlated and controllable.

Our test installations show that some degree of control can be achieved over corrosion and deposition by bringing the well structure to an approximate electrical balance. In several instances electrically balancing has resulted in greatly increased production. In one well production jumped from 14.75 bbl. per day to 168 bbl. per day.

The approach to the problem presented here should not be misconstrued as another application of cathodic protection. It is just the opposite.

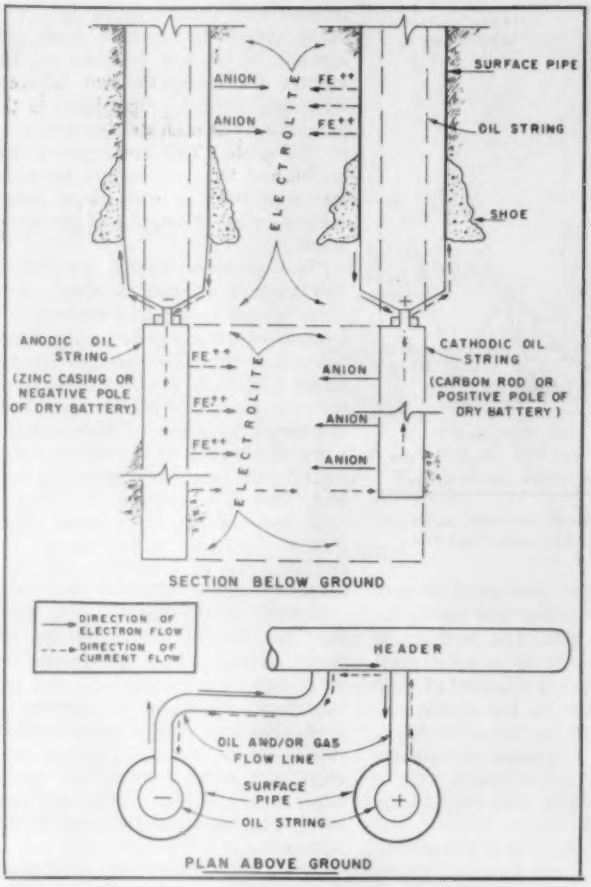
Numerous articles have been published on the application of cathodic protection to oil-well structures.[1 7 8 10 13] There is a tendency to assume that any anticorrosion method involving the application of electromotive force is an application of cathodic protection. Cathodic protection consists of impressing electromotive forces on an underground structure through auxiliary anodes in such a way as to make the entire structure cathodic with respect to the adjacent soil.[15 16] It envisions current entering and flowing on the structure for its full length. Cathodic protection increases the amount of current flowing on the structure.

Electrical balancing is accomplished with a counterelectromotive force which prevents current from entering the structure. This balancing brings the oil string to substantially a neutral potential with respect to the surrounding soil, and the flow of current throughout the structure is reduced to a minimum.

Current flow between wells can be likened to that in a dry-cell battery. The oil string of the anodic well represents the zinc casing or negative pole of the battery. The oil string of the cathodic well represents the carbon rod or positive pole of the battery. The strata penetrated by both wells above the shoe of the surface pipe or the flow lines, or both, represent the load resistance that shorts the dry-cell battery. This comprises an electrogenetic or self-energizing cell, and is a completely closed electrical circuit composed of four legs.

One leg is the subsurface metallic structure of the anodic well. The second is the strata below the surface pipe which serves as the electrolyte for supporting current flow to the third leg which is the cathodic well structure. The fourth leg is the low-resistance areas adjacent to the surface above the shoe of the surface pipe or the flow lines, or both, which may connect at the header, Fig. 1.

Two types of cells. Both types of electrolytic cells are found in the normal transfer of current between two



THEORETICAL FLOW of current between two well structures. Fig. 1.

About the authors . . .

V. C. CRITES

M. K. FJELDSTED

V. C. Crites has been engaged in electrical, mechanical, chemical, and electronic research and development activities as an individual contractor since 1915. His petroleum-related activities include such achievements as perfecting a method of heavy-crude dehydration, design and fabrication of a pure displacement deep-well pump, and development of a method for controlling corrosion in producing oil wells. One of his current projects involves acceleration of corrosion in developing a new method of high-speed electrochemical milling. Crites is a member of NACE.

M. K. Fjeldsted is a senior research engineer with California Institute of Technology, jet propulsion laboratory, Pasadena, Calif., where he supervises planning, design, and construction of highly specialized research and development facilities. For the past five years he has, on his own time, worked closely with Crites on controlling corrosion in oil wells. He is a graduate of Utah State University, is a registered professional engineer in Utah, and is also a member of NACE.

well structures, the action of each causing corrosion. One type of electrolytic cell is called an electrogenetic cell which generates electricity such as an ordinary dry-cell or flashlight battery. The other type is called an impressed-current cell, such as is found in electroplating systems where current from an outside source is fed into the system.[3 9]

In the area below the shoe of the surface pipes. the oil strings and electrolytic conduction of the strata constitutes an electrogenetic or self-energizing cell, and the resultant flow of current decomposes the anodic oil string.

The surface pipe at the shoe is set in cement. This alters the potential of the pipe,[4] thus assisting the termination of the electrogenetic cell at this point.

The current flowing from the anodic oil string to the cathodic oil string, Fig. 1, is fed by the cathodic oil string into the surface pipe or the flow lines, or both, connnecting the two well structures. A portion of this current is conducted by the flow line. Some of the current thus impressed on the surface pipe encasing the cathodic oil string leaves the surface pipe through the low-resistance areas adjacent to the surface. This forms an impressed-current cell, causing corrosion where the current leaves the pipe. Current flows to the well structure, the oil string of which is the anode of the electrogenetic cell. The current enters the surface pipe and flows on it to some point or points where it leaves to enter the anodic oil string, thus completing the electrical circuit.

Control of electrical current in any one leg of a closed circuit will control the current in every leg of the circuit, just as opening a switch in one leg of a circuit will break the circuit.

Current flowing on a well structure is not limited to the casing, but is transferred to or from the tubing at points where the tubing contacts the casing, and to or from the rods where the rods contact the tubing.[10] This contributes to corrosion and precipitation problems found in these portions of producing wells. It follows that by controlling the current flowing on the casing, control is achieved throughout the well structure. Insulation flanges in the flow lines serve to break the electrical connection between the structures at the surface.[7 10]

Specific Theory

Counterelectromotive forces properly applied in the low-resistance areas near the surface can control the current flow in the entire circuit. The amount of current flowing in any electrical circuit is a function of voltage and resistance. As the potential difference normally existing between well structures is small, it naturally follows that a small counter-electromotive force potential, properly used, is enough to effect electrical balance. Magnesium anodes are used because the current requirements are negligible, and a steady energy release is needed for successful operation. This means that the current requirements are generated within the installation itself, with no outside sources of current or energy used in maintaining the electrical balance.

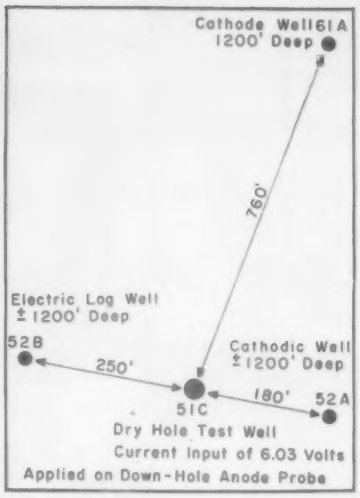
The fact that the major cause of corrosion is attributed to electrolysis is generally accepted and well publicized.[3] The electrical precipitation of calcareous materials has been observed as a coating on the external walls of casing and is accepted as an indicator of electrical current flow.[3 8 13 14 15] The formation and precipitation of bitumens have been attributed to the electrical effects resulting from flow of crude oil through the sand and tubing.[2 12] Also, the fact that asphalts and paraffins can be electrically precipitated is well established and documented.[2 5 6 11 12]

New theories presented in this article are: (1) There are two or more wells involved in the electrogenetic cell, and (2) the subsurface flow of current between the wells on the various geological formations and parallel to the formations, is in accordance with the law that electricity flows over any available path, inversely in proportion to the path's electrical resistance.

Substantiating evidence is to be found in a well drilled by Honolulu Oil Co. at Cymric field, California. The location of the well with respect to others involved is shown in Fig. 2.

The primary reason for drilling this test well was to find out if the subsurface strata could be used for salt-water disposal without contaminating fresh-water zones. To make the test successful it was necessary to drill the well without using water or mud.

No water or mud was used in drilling to 270 ft. At each 5-ft. interval the drill was removed from the hole and an insulated conductor with a steel probe on the end was run to the bottom of the hole. The steel probe was heavy enough to make good electrical contact. A potential of 6.03 volts was applied to this probe and current passed to the two offset wells, 52A and 61A. The same external resistance was used, and each well in turn, 52A and 61A, was used as the cathode for the return circuit. The test was continued to a depth of 270 ft.



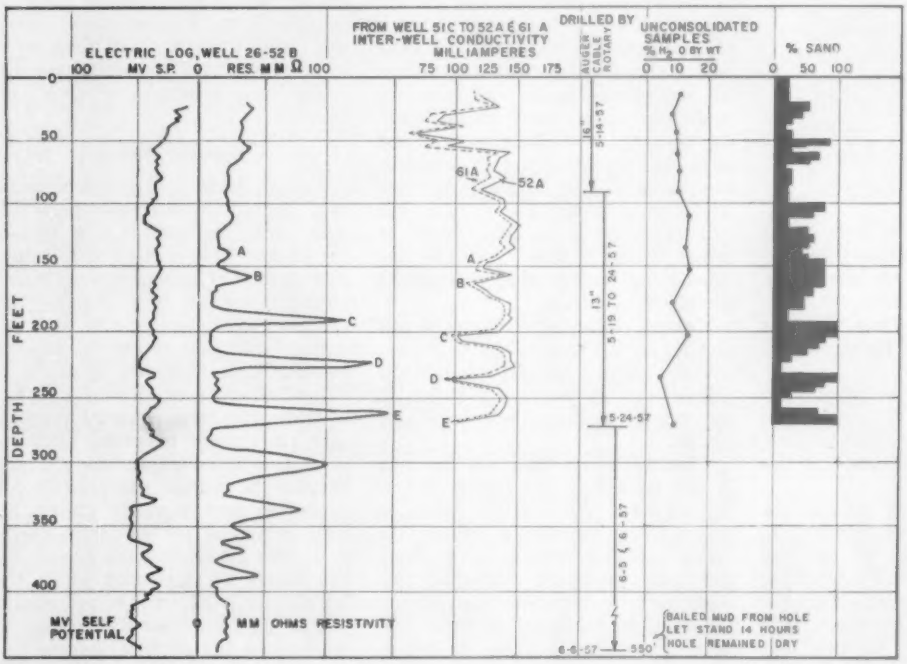
RELATIVE POSITION of the wells involved in the Cymric test. Fig. 2.

The following extract is from a report by Honolulu Oil Co., dated July 29, 1957: "When electrical energy was introduced by a probe (anode) into various strata of a well being drilled by cable tools, the amount of current received by the casings (cathodes) of two adjacent wells was roughly proportional to the conductivity of each stratum contacted by the probe. This conductivity was established by conventional electrical logs supplemented with visual examination of cored samples of the strata tested.

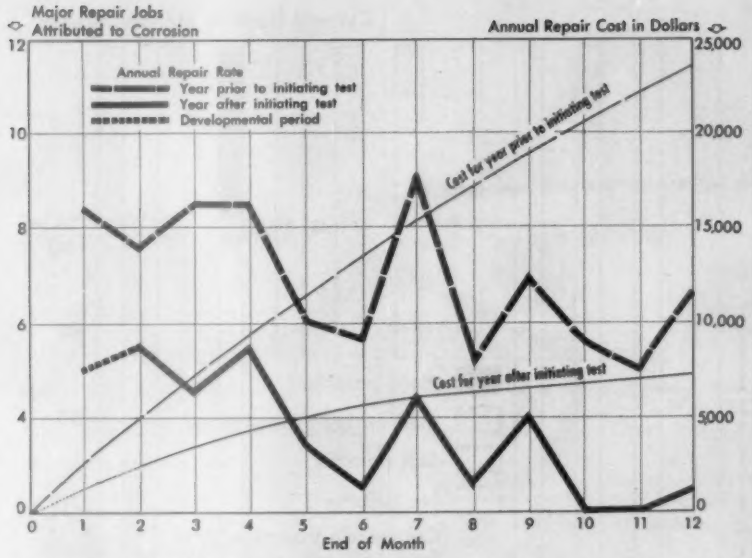
"It is probable, though not proved, that current entering a highly conductive stratum traveled through this stratum to the cathodic casing. Likewise, it is probable that current entering a stratum of low conductivity traveled obliquely either upward or downward to strata of high conductivity and thence to the cathodic casing. If the latter assumption is correct, then it is obvious that in this case the amount of current transmitted would be a function of the conductivities of both high and low-resistance strata."

Results of the test, Fig. 3, show that the current introduced by the probe correlated with the electric log of 26-52B. The current flow for this impressed voltage was negligible, as it resulted from only a point contact. Had a larger anode or contact area been used, more current flow would have resulted. The curve resulting from such increased flow would still correlate.

The Cymric test is considered proof that current released in the subsurface strata travels parallel to stratum in which it is released. As the release of energy is equal in all directions, a



CURRENT introduced into the subsurface strata by the test electrode gave a pattern that correlates with the electric log of the well. This is an indication that current travels parallel to stratum in which it is released. Fig. 3.



THIS CHART COMPARES the number of repair jobs required in a 14-well test before and after electrical balancing was accomplished. Costs are estimated on the basis of $200 per repair job. Fig. 4.

corresponding potential is applied to any other well structure which the field of force might encompass.

The repeatability of results obtained in the following case histories and many others, is also evidence to support the correctness of the theories.

Each well presents a separate engineering problem. The location, number, and depth of the anodes required depend on the proper interpretation of a number of variables.

Some of these are: (1) the polarity of the wellhead, whether current is entering or leaving the structure at or near the surface; (2) the direction of current flow, subsurface and radially, in respect to the well structure; (3) the center line of the field of force; (4) the distance from the well to the anodes; (5) the density of subsurface current flow; and (6) the counterelectromotive force to be released from the anodes to properly balance the structure.

In addition, some thought must be given to such physical properties as: (1) the depth of the wells; (2) the number of pipe strings; (3) the length ratio of the surface pipe to the production string; (4) the permanent moisture content of the upper soil layers; (5) topography; and (6) the above-ground metallic production equipment.

Procedure

Because of the unique nature of the problem, only a general description of the balancing procedures can be included here.

A subsurface electrical survey is made of each well by drilling a series of holes radially about the well in predetermined locations 25 to 50 ft. from the wellhead. These holes are drilled 12 to 60 ft., depending upon the type of soil and moisture content. Calibrated carbon electrodes are lowered in the holes and submerged with salt water. The potential difference between each electrode and the wellhead is measured to determine the relationship of the potentials supporting current flow in the subsurface zones. This will also fix the center line of the field of force created by the current flow.

Then, one anode bed is placed approximately on the center line of the field of force, and one other at each side of the center line to extend the field of the counterelectromotive force. Generally, 17-lb. magnesium anodes connected in parallel are buried in each hole to a predetermined depth that may range from 12 to 60 ft. The distance from the wellhead to the anodes depends on the individual well and surface equipment. Leads from each anode bed are connected in parallel to a variable resistor which is connected in series with the wellhead. The output of the resistor is regulated to suppress about 90 to 95% of the potentials established by the electrogenetic cell. If the output of the anodes were permitted to exceed 100% of the potential to be suppressed, the direction of flow would be reversed on both wells and the problems would be compounded.

Seventeen-pound anodes in use for over 6 years show no signs of potential loss and have required only infrequent checks of the rheostat output. The installations are completely self-contained and below ground except for a monitoring meter.

Case Histories

Case histories presented here were compiled from information and records furnished by the owners of the wells. Good results have been obtained on every well that has been electrically balanced.

Case 1. During 1947 and 1948 some 14 independent-oil-company wells in California were electrically balanced. The wells had had severe corrosion problems.

From records furnished by the producers during the experiment, Fig. 4, corrosion in the 14 wells had caused 117 pulling jobs during the preceding year, and only 24 pulling jobs due to corrosion were needed during the remainder of the year after being electrically balanced.

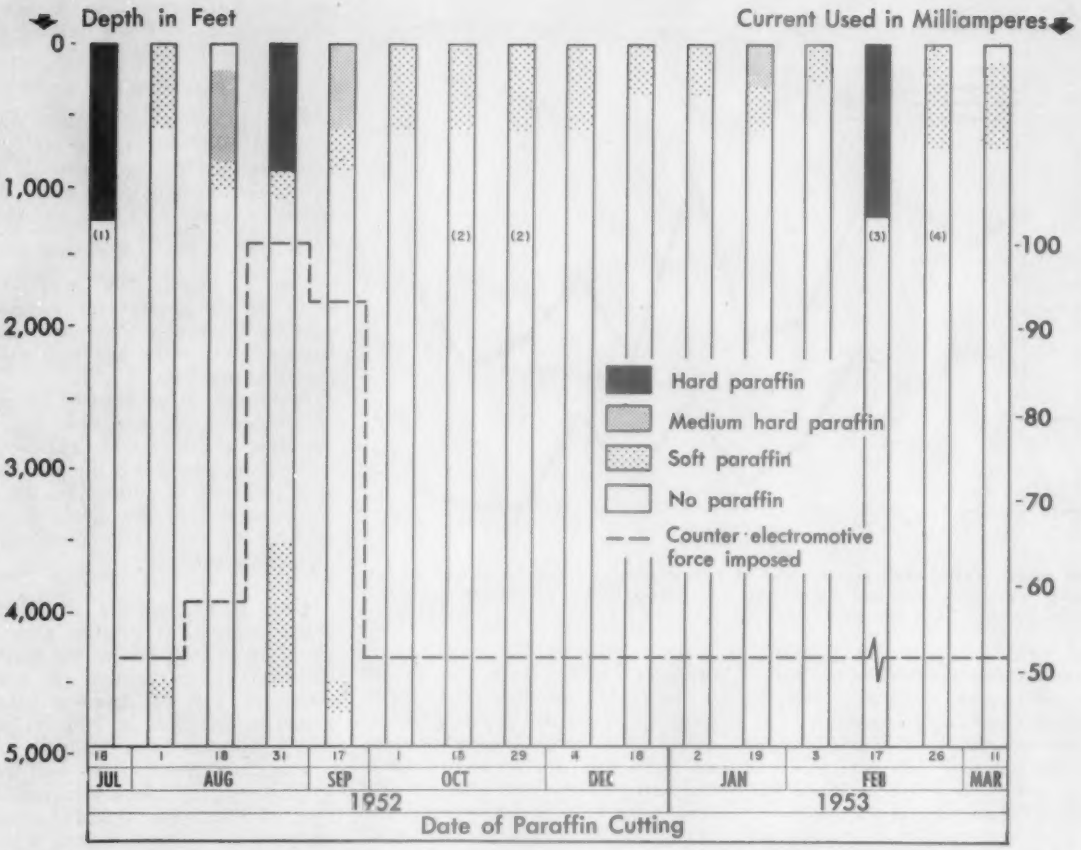
Case 2. Precipitation of organic materials such as paraffin and asphalt are in part due to the normal electrical charge existing on well structures. This was demonstrated on a gas-lift test well in New Mexico which produced from 6,200 ft.

Paraffin deposits in this well were in the tubing. A counterelectromotive force of 52 ma. was applied to achieve an electrical balance. Before balancing the well, the paraffin-cutting tool could be driven only a few feet at a time and required about 4 hours to reach 1,200 ft. After balancing, the consistency of the deposit was such that the tool would go clear to bottom by its own weight, in about 15 minutes.

Fig. 5 shows that the counterelectromotive force needed to balance a well is critical and a variation of only a few thousandths of an ampere will change not only the character of the deposit but the area in which it is deposited.

Case 3. Scale, a deposit of inorganic materials, is precipitated by the normal charge existing on a well structure. This was demonstrated on a West Texas gas-lift test well producing from the Ellenburger formation at 8,300 ft. The well had a history of severe accumulations of calcium carbonate in the tubing, gas-lift valves, and flow lines, Fig. 6.

On July 30, 1952, the tubing and flow lines were cleaned, nine new flow valves installed, and batch injection of inhibitor started in an effort to control the accumulations. On August 4, 1952, a production test showed 250 bbl. of oil and 5,000 bbl. of water. On November 11, 1952, seven of the nine valves were found to be



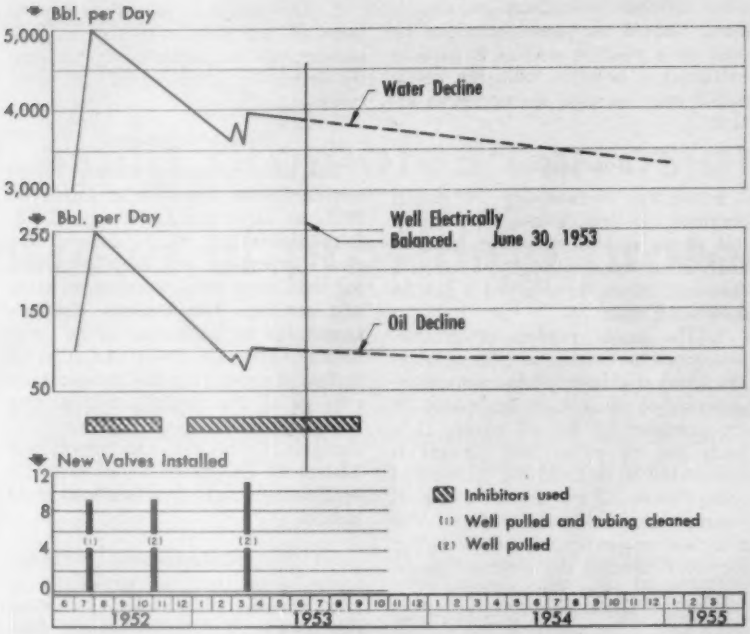
RESULTS OF A SERIES OF TESTS on a well having paraffin-plugging problems. Counterelectromotive force current was varied intentionally to find what effect it had on asphalt precipitation. Before balancing, the paraffin deposit was hard and difficult to cut. With the proper applied current, the paraffin became soft, and cutting was not difficult. Note that during the week of February 17, 1953, the paraffin was hard again. The balancing system was disconnected during this time to see if the deposits would revert back to its pretreatment character. It did. Fig. 5.

filled and plugged with scale deposits. The nine valves were replaced and use of inhibitor was discontinued. On December 17, 1952, a treatment with a different inhibitor was started. On March 28, 1953, a production test showed 79 bbl. of oil and 3,556 bbl. of water. On March 30, 1953, the tubing was pulled and nine valves replaced and two added. On March 31, 1953, a production test showed 101 bbl. of oil and 3,942 bbl. of water.

On June 30, 1953, the well was electrically balanced with a counter-electromotive force current of 114 ma. In September 1953 less than 3 months after the well had been electrically balanced, injection of chemical inhibitors was discontinued. There was no further work recorded until January 20, 1955, at which time a production test showed 80 bbl. of oil and 3,300 bbl. of water. This test period is illustrated in Fig. 7.

Case 4. In August 1955, an installation was made on a pumping well completed at 3,400 ft. in the upper Brown sand in the Signal Hill

SAMPLES of 14 months' accumulation of calcium carbonate from a West Texas gas-lift well before electrical balancing equipment was installed. The larger sample was removed from the flow line, the smaller one from the tubing. Fig. 6.



USE OF INHIBITORS was discontinued, and no pulling jobs were required in this well after it was balanced electrically. Normal decline in production was arrested, and the well started producing more than it did before the last repair job. Fig. 7.

field, California. This well had been declining rapidly. For the year prior to electrical balancing, the decline amounted to 13½ bbl. net per day. The well had been pulled on an average of four times a year, and pump repairs were required at least once a year. Oil gravity was 22°, and the water cut was between 4 and 5%. Corrosion of balls and seats was the reason for pump repair, and waxing of the pump and rods required pulling and cleaning. Operator found it impossible to lower the pump to bottom because it would wax up completely in a week or so. The well was brought to an electrical balance, and since then the pump has been on the bottom with no evidence of waxing. The well has been pulled only once in the last 5 years, and then to replace a completely wornout pump.

No evidence of corrosion has been found since the well was electrically balanced, nor has there been any further decrease in net production. The counterelectromotive force current required to balance this well was 100 ma.

Case 5. An edge well pumping in Huntington Beach field, California, was electrically balanced on March 15, 1956. This was a whipstocked completion at 2,725 ft. equipped with a gravel-packed liner. The gross daily production was approximately 250 bbl.; and for the month prior to electrically balancing the well, the total net production was 5.8 bbl. per day. This low oil-water ratio failed to provide enough lubrication for pumping in a crooked hole, so there was excessive wear on the tubing, rods, and boxes. The well was badly corrosive which further complicated the problem. Inhibitor was added daily, but severe corrosion continued.

After being balanced with 90 ma. of current, corrosion was no longer a problem. The production increase shown in Fig. 8 provided more lubrication and reduced wear.

Case 6. An installation was made in November 1954 on a pumping well in Seal Beach field, California. This well is producing from the upper Bixby sand at 4,600 ft.

The well produced a gross of between 700 and 800 bbl. per day and was very corrosive. Iron content ran from 28 to 35 p.p.m. Two gallons of inhibitor was used daily, but severe corrosion continued in the tubing, rods, and pumps.

When the well was balanced, the use of inhibitor was stopped, and none has been used since. Within 15 days after balancing, the iron content dropped to between 2 and 6 p.p.m.

Today, nearly 6 years later, the well is virtually trouble-free. Gross production is 895 bbl. per day, 95.9% water. The counterelectromotive force needed for this job was 50 ma.

Saving on inhibitor alone has amounted to $1,460 per year for the past 5 years.

Case 7. The most dramatic of all tests was one made on a pumping well in 35-year-old Inglewood field, California. This one demonstrated corrosion control, and also the successful control of wax deposits and scale. And production increased from 14.75 bbl. net per day to a high of 168 bbl. net per day.

This well was completed on May 21, 1950. Average for the first month of its productive life was 325 bbl. per day, cutting 88% water for a net of 39 bbl. 20° API oil per day. By the time the well was balanced on September 29, 1954, the net oil production had declined to 14.75 bbl. per day, and water had decreased to 280 bbl. per day.

This well was comparatively new, and the precipitated wax and scale behind the liner had not become dense. With the electrical charge removed, the precipitants behind the liner began to loosen from the washing action of the produced fluids and were carried on into the well bore.

It soon became evident that the fluid level had risen, and production rate continued to increase. It reached a maximum in July and August 1957, when the gross production was 612 bbl. per day; 168 bbl. oil and 444 bbl. water.

During a bailing operation in January 1958, the liner hanger parted and the liner was lost. No repair has been made. The well cannot be bailed below the shoe of the casing; consequently, it now is producing from an open hole but still makes from 40 to 50 bbl. net per day. No other well in this field has increased its production once it had started to decline.

After being on production for over 9 years, the well is currently producing as much oil as it produced the first month of its productive life.

This well had been highly corrosive with an iron count of from 30 to 35 p.p.m. Pumps removed from this well frequently were kept on display to show the worst type of corrosive attack. Within 30 days after being balanced, the iron count had dropped to 7 to 10 p.p.m.

On March 17, 1955, the lease superintendent noted that the milliammeter at the well was not working, and discovered that the ground lines had been cut in the laying of a water line. It was not until late in the afternoon of March 22, 1955, that the lines were repaired and current flow restored to the well. Table 1 shows the results of the brine analysis before and after repair of the ground line.

The value of this installation to the

TABLE 1—CHANGE IN IRON CONTENT OF BRINE DURING INTERRUPTION OF WELL BALANCING CURRENT

Date of analysis—	Iron count in brine (p.p.m.)
March 15, 1955	3.0
March 16, 1955, ground lead cut	...
March 18, 1955	7.9
March 22, 1955 (a.m.)	8.7
March 22, 1955 (p.m.), ground lead repaired	...
March 25, 1955	3.9
April 2, 1955	1.0
April 5, 1955	1.5

producer would be difficult to determine. It has solved the problem of corrosion in the well for the past 6 years and simultaneously has increased production by a remarkable degree. Although the field is 35 years old, the installation furnishes proof that oil is still there. With the liner free from precipitants, the test well is producing oil that otherwise might be produced by adjacent wells if their liners were not plugged by an accumulation of precipitated material.

Summary

Test wells were selected because of the severity of their particular production problem, and in all cases the wells were benefited by being electrically balanced. Even though old problem wells can be benefited, the results lead to the conclusion that by electrically balancing wells when they are new, before production problems start, wells could produce at a high rate for a longer period of time at less cost.

To attempt to describe the electrical balancing procedure in detail would serve only to confuse the reader, as the balancing of a negative well, one where current is entering at or near the surface, and the balancing of a positive well, one where current is leaving at or near the surface, require different procedures and equipment. Should the same technique be used on a positive well as is used in balancing a negative well, the result would only increase the corrosive attack.

Conclusions

From the repeatability of results obtained on installations reported in this paper and many others, and an analysis of the electrical and electrochemical principles involved it can be concluded that:

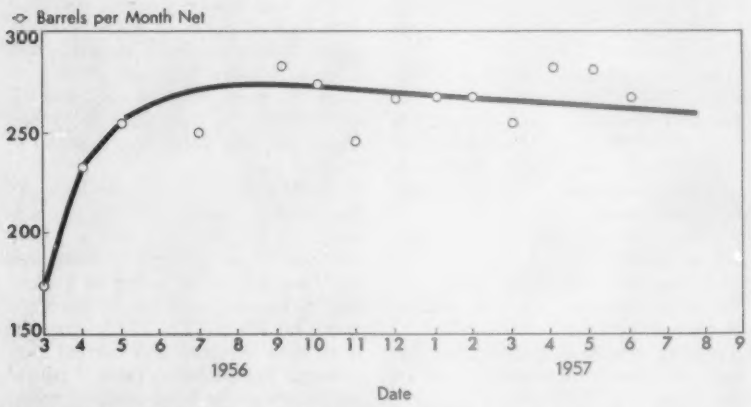
1. The major portion of production problems related to electrochemical action within or on the subsurface structure of oil wells is dependent on the potential of the oil string. It is from the oil string that current is transferred to or from the tubing and rods. Failure of the oil string admits water to the producing horizon. The electrical properties of the oil string, therefore, control the electrochemical action throughout the structure.

2. A counterelectromotive force applied in accordance with the procedures described in this article will reduce the potential difference between the oil strings of wells involved in the electrogenetic cell to approximately zero. Current flow between and on these oil strings will be correspondingly reduced as will the transfer of current to the tubing and rods they encase.

3. Corrosion of rods, tubing, pumps, and casings due to electrolysis can be substantially reduced by electrically balancing the current flow between the oil strings.

4. Current between oil-well structures flows parallel to the surface on the various geological formations to the depth of the well involved, in accordance with the electrical law that electricity flows over any available path, inversely in proportion to the path's electrical resistance.

5. The downhole electrical depositions of inorganic and organic substances can be substantially reduced by electrically balancing oil well structures.



PRODUCTION INCREASE that actually occurred as a result of electrically balancing a well in Huntington Beach field, California. Fig. 8.

Acknowledgments

The authors express sincere appreciation for the assistance of James W. Wilt, of Honolulu Oil Corp., L. S. Richardson, and W. L. Schryer for their cooperation and help in collecting data from field experiments, tests, and records. The authors also acknowledge the assistance of Dr. William F. Seyer, University of California at Los Angeles, for his technical review of all the author's theories and data from which this article was written; also, for his literature survey and laboratory experiments on electrical precipitation of hydrocarbon substances.

References

1. G. L. Doremus, W. W. Mach, and J. J. Lawnick, "Application of Cathodic Protection to 48 Well Casings and Associated Production Facilities at Waskom Field": Corrosion, August 1956.

2. Herman Dykstra, Karl Beu, and Donald L. Katz, "The Precipitation of Asphalt from Crude Oil by Flow Through Silica": Paper presented at the Los Angeles meeting of AIME, October 21-23, 1943.

3. W. E. Edwards, AIEE, "Electrochemical Aspects of Underground Corrosion and Cathodic Protection": Electrical Engineering, October 1956.

4. D. Houseman, speaking at the fall meeting of NACE in Los Angeles, 1958.

5. Robert A. Keeler and Louis C. Terminello, Vitro Laboratories, "Electrophoreses—A New Coating Tool": American Machinist, May 18, 1959.

6. Eric Keightley Rideal, "An Introduction to Surface Chemistry": Cambridge University Press, 1930.

7. W. C. Koger, "Casing Corrosion in Hugoton Gas Field": Corrosion, October 1956.

8. Dr. Leendert de Witte, "Current Requirements for Cathodic Protection of Well Casings": The Oil and Gas Journal, May 9, 1955.

9. C. L. Mantell, PhD, "Electrochemistry": Chemical Engineers Handbook, McGraw-Hill Book Co., Inc., New York, 1950.

10. Paul Menaul, "What Causes Corrosion in Pumping Wells?": World Oil, January 1957.

11. J. Powney and L. J. Woods, "Electrophoretic Mobility of Oil Drops in Detergent Solutions": Transactions of the Faraday Society, Vol. 35, 1940.

12. G. W. Preckshot and D. L. Katz, "Asphaltic Substances in Crude Oils, Investigations from a Colloidal Standpoint": Transactions of AIME, Vol. 151, Petroleum Development and Technology, 1943.

13. J. D. Sudbury, "External Casing Corrosion; Cause, Effect, and Control": World Oil, January 1957.

14. J. D. Sudbury, "External Casing Corrosion—Where Is It? How Bad Is It?": World Oil, May 1957.

15. Corrosion of Oil and Gas-Well Equipment, sponsored by NACE and API, Division of Production, API, Dallas, 1958.

16. Underground Corrosion, National Bureau of Standards, Circular C-450, p. 250, U. S. Department of Commerce.

This author makes the startling statement that

"Casing promotes corrosion at crossings instead of providing protection"

Casings seem to be an overhang from old days before cathodic protection and before much of the fine welding work so commonly in use today was developed. Perhaps casings may not be totally eliminated but it seems that a great many could be eliminated. Both parties involved at a crossing would benefit.

BY ROBERT J. KUHN

. . . consulting engineer, New Orleans. Kuhn originated large-scale cathodic protection of pipelines. Success of his method since early application in 1928 on buried lines in New Orleans led the way to establishing cathodic protection in the pipeline industry. In 1923 he graduated from Tulane University with a BE degree in mechanical engineering; in 1934 he received an advanced degree in electrical engineering. From 1923 to 1936, he was electrolysis engineer with New Orleans Public Service, Inc. Since 1936 he has been a consultant.

CASING does not enhance the safety of a crossing since it permits, even promotes, corrosion of the carrier pipe by preventing cathodic protection of the pipe. It would make better sense to use the money spent for the casing to install a well-coated carrier pipe, made of either higher-strength steel, or heavier wall pipe if need be.

In this type of construction the structural strength of the crossing would be improved, and corrosion would be entirely prevented by the combination of good coating and adequate cathodic protection of the carrier pipe. And there would be no casing present to prevent the effective cathodic protection of the crossing.

Long-standing practice. For the past half century or more the practice of encasing many pipelines crossing railroads and highways has been followed. These pipelines were usually high-pressure gas or oil lines, but oftentimes low-pressure gas distribution mains in city areas were also encased.

In most instances, the casings were installed, not voluntarily by the pipeline owners, but at the behest of the facility being crossed.

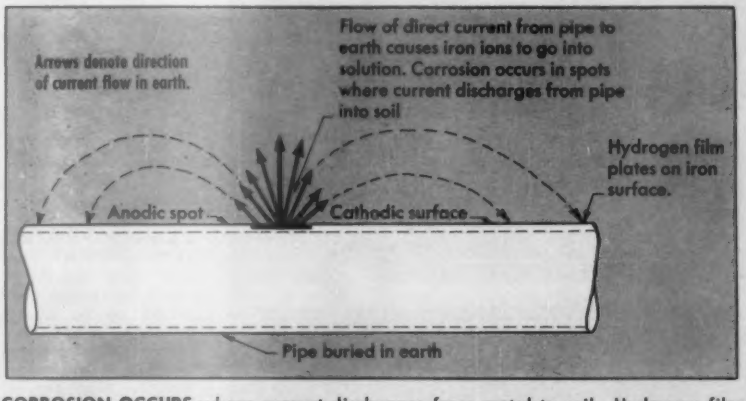
Within the past 10 years or so, determined efforts have been made by the railroads and the various state highway commissions to require encasement of all pipeline crossings regardless of size, pressure, or nature of product carried. Ostensibly, safety is given as the reason for requiring the casing. The reasoning that the casing enhances the safety of the crossing is, to say the least, somewhat specious.

Casings seem to be an overhang from the old days before cathodic protection and before much of the fine welding work so commonly in use today was developed.

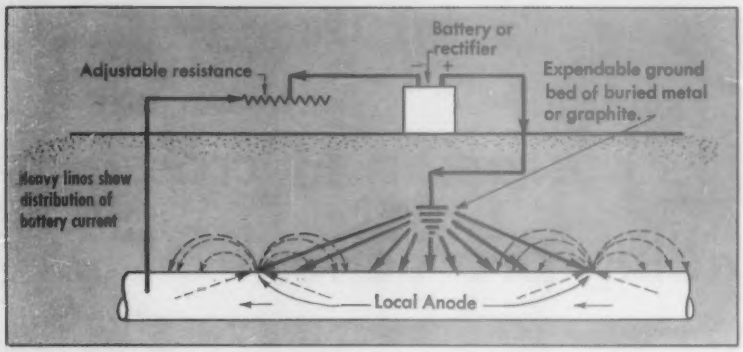
Perhaps casings may not be totally eliminated but it seems that a great many could be. Both parties involved at a crossing would benefit.

Design no problem. Let us presume that good civil engineers can design an uncased pipeline crossing sufficiently strong structurally that the carrier pipe will neither break, deform, nor deflect excessively from the combination of internal pressures and external loads. With modern advanced techniques of radiographic examination of welds, and the use of higher strength steel or thicker pipe walls, it certainly seems entirely reasonable that such crossings can be designed and installed with perfect assurance that the pipe will neither deflect nor deform beyond elastic limits, nor will it break at a weld.

Why then do the railroads and the highway commissions, whose civil engineers are among the finest in the country, insist upon encasement, when they know full well that uncased carrier pipe crossings can be designed and built to safely withstand structural failures from internal pressures and external loads? Patently, their con-


Arrows denote direction of current flow in earth.
Flow of direct current from pipe to earth causes iron ions to go into solution. Corrosion occurs in spots where current discharges from pipe into soil
Hydrogen film plates on iron surface.
Anodic spot
Cathodic surface
Pipe buried in earth

CORROSION OCCURS where current discharges from metal to soil. Hydrogen film forms where current collects on pipe. No corrosion occurs where current collects from earth to pipe surface. Fig. 1.


Battery or rectifier
Adjustable resistance
Expendable ground bed of buried metal or graphite
Heavy lines show distribution of battery current
Local Anode

CATHODIC-PROTECTION PRINCIPLE. Dotted lines show paths of current from local corrosion cell. By proper adjustment of resistor the galvanic currents streaming from local anodes can be bucked down to zero, or battery current can be forced to collect at the local anodes, rendering the original corrosion cell inoperative, thus stopping corrosion. It is the electrolytic collection of the extraneous current which does the work. Fig. 2.

cern is that corrosion will either perforate the pipe walls, or will gradually eat away the wall thickness to such an extent that the beam strength of the pipe will be weakened and structural failure will eventually occur.

Casing causes corrosion. Any good corrosion engineer knows that a well-coated pipeline crossing can be completely protected from corrosion by properly designed and well-maintained cathodic protection, provided there is no casing around the pipe. For a number of very convincing reasons, the casings seriously hamper, and in some cases completely prevent cathodic protection of the carrier pipe.

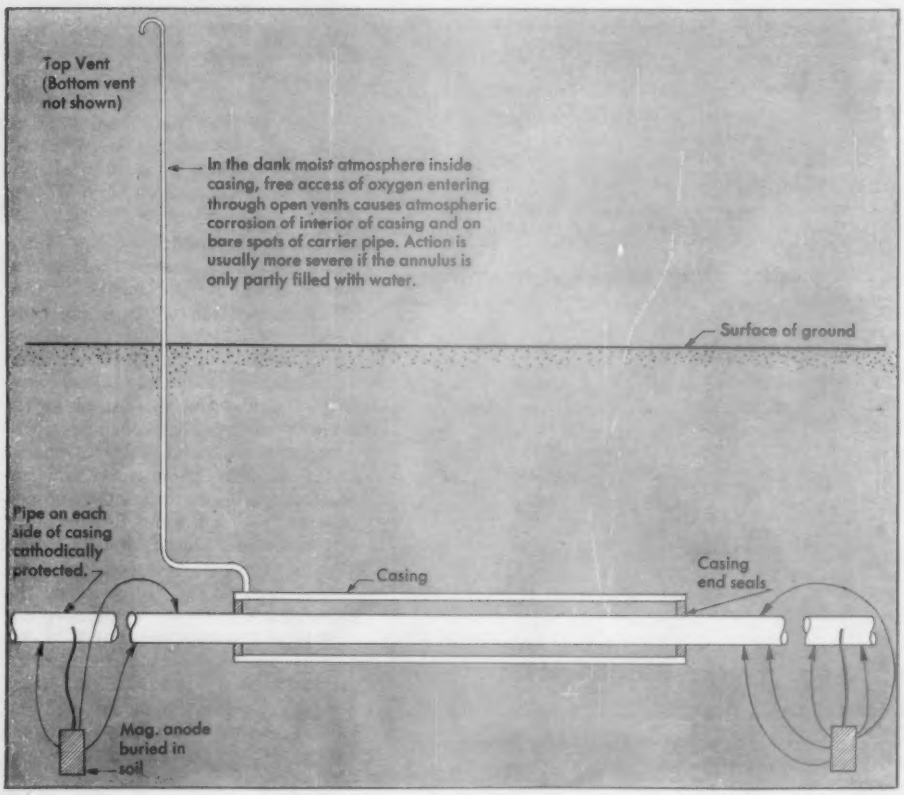
In order to understand the apparent paradox that the casing detracts from rather than enhances the safety of the pipeline crossing, let us inquire into the basic fundamental principles of underground corrosion and the electrical process known as cathodic protection which has been so effective in preventing corrosion.

Consider first the generally accepted concept of the electro-chemical corrosion action on a bare buried pipe (Fig. 1). Direct current, discharging from anodic spots on the pipe into the soil, or electrolyte, causes corrosion at the spots where the current discharges flow through the soil and collects elsewhere on the pipe at portions known as the cathodic spots.

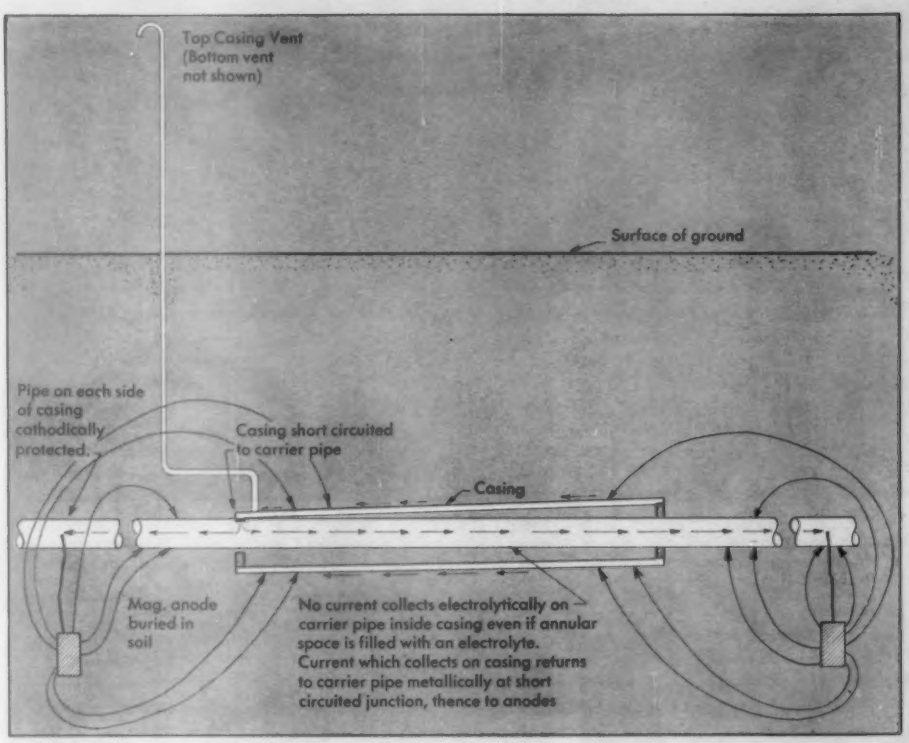
No corrosion occurs at the cathodic spots where the current collects. This constitutes the basis for the cathodic-protection theory. If an extraneous current can be forced to collect on the entire pipe surface, including the spots that were cathodic as well as the spots that were anodic, and the extraneous current is regulated to buck down to zero and even override the corrosion current streaming from the anodic spots, obviously galvanic corrosion will have been stopped.

The extraneous current is usually furnished by a rectifier feeding into a buried sacrificial ground bed, or by buried galvanic anodes of zinc or magnesium. This process is illustrated schematically in Fig. 2.

Thus it is the electrolytic collection of current on an underground metallic surface which prevents corrosion, whereas the electrolytic discharge of current from a buried metallic surface causes corrosion. Of itself, current flowing linearly along a pipeline neither causes corrosion nor prevents it.


Top Vent (Bottom vent not shown)
In the dank moist atmosphere inside casing, free access of oxygen entering through open vents causes atmospheric corrosion of interior of casing and on bare spots of carrier pipe. Action is usually more severe if the annulus is only partly filled with water.
Surface of ground
Pipe on each side of casing cathodically protected.
Casing
Casing end seals
Mag. anode buried in soil

CATHODIC-PROTECTION CURRENT cannot collect electrolytically on carrier pipe inside casing unless annular space between the two pipes is filled with an electrolyte. Nor can it collect if casing short circuits to carrier pipe. Fig. 3.



CURRENT DISTRIBUTION when casing is short circuited to carrier pipe. Fig. 4.

It is only the electrolytic discharge of current or the electrolytic collection of current that determines whether the underground pipe will corrode or will be cathodically protected.

Casing-pipe systems. Next, consider the case of a cathodically protected carrier pipe inside a casing which is electrically insulated from the carrier pipe (Fig. 3). The cathodic-protection currents will collect electrolytically on the carrier pipe on each side of the casing. But it will not collect electrolytically on the carrier pipe inside the casing unless the casing is essentially bare and the annular space between the two pipes is filled with an electrolyte. These two conditions sometimes, but not always, prevail.

If the annular space is not completely filled with an electrolyte, full cathodic-protection current cannot collect electrolytically on the casing, flow through the casing wall, and collect electrolytically on the carrier pipe. Where the carrier pipe inside the casing is not fully covered, severe atmospheric corrosion on the exterior of the carrier pipe and on the interior of the casing, fed by an abundant supply of oxygen from the open vents, will proceed despite the fact that the carrier pipe on each side of the casing may be fully protected.

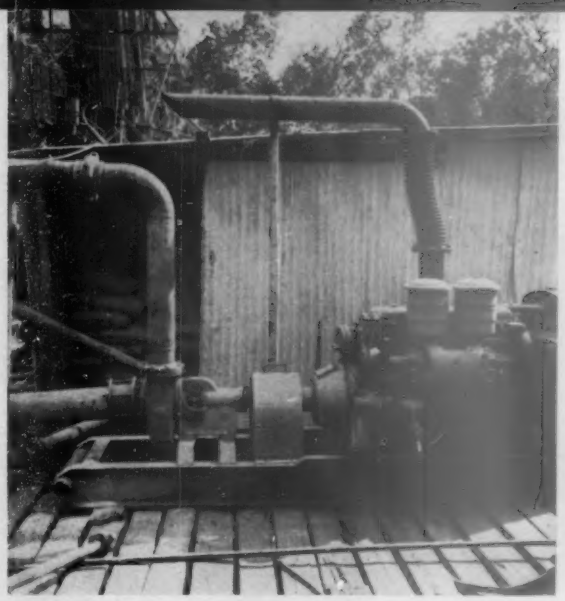
Where the annular space between the carrier and the casing is filled with an electrolyte, the degree of protection to the encased carrier pipe will, to a large extent, be determined by the quality of coating on the exterior of the casing. If the casing is bare, as is frequently the case, it is possible that sufficient current could collect electrolytically on the casing (thus protecting its exterior surface), flow through the pipe wall into the electrolyte and thence collect electrolytically on the bare portions of the carrier pipe. This would afford the pipe some degree of protection, but at the same time would cause corrosion to the interior surface of the casing wall because of electrolytic discharge.

If the casing is a well-coated pipe, in all probability only a modicum of current would collect on it, move through the pipe wall into the electrolyte, and collect on the carrier pipe. This current would be too small to either seriously corrode the interior wall of the casing or to afford adequate cathodic protection to the encased carrier pipe. Usually more corrosion occurs when the annular space between the two pipes is only partially filled than when the annulus is completely filled.

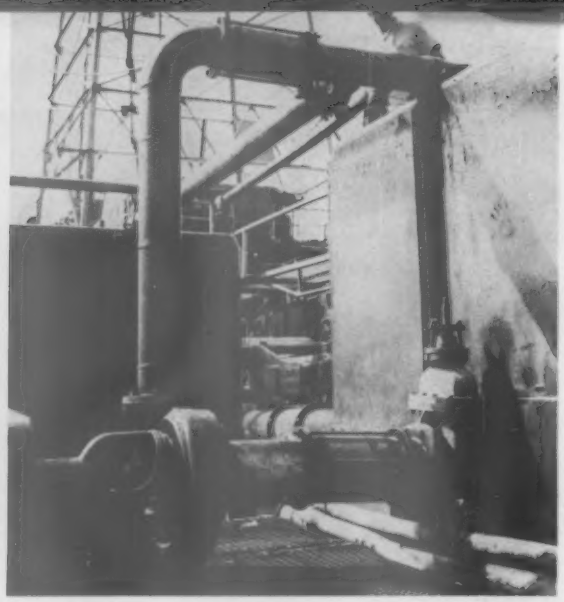
Short circuiting. Probably the most important single factor causing corrosion of a carrier pipe inside a casing is the accidental short circuiting of the casing to the carrier. This frequently occurs because of failure of the end casing seals due to vibration, settlement, or both. When this occurs, as it usually does, there is absolutely no chance of cathodically protecting the carrier pipe inside the casing. The cathodic protection currents will then collect electrolytically on the casing exterior, but will flow to the carrier pipe not electrolytically, but by direct metallic contact at the short-circuited junction, (Fig. 4).

If the casing is bare, not only will the accidental short-circuit prevent cathodic protection of the carrier pipe within the casing, but it will also destroy the effectiveness of cathodic protection on the balance of the carrier pipe on each side of the crossing. The bare casing will drastically reduce the over-all resistance to earth of the coated carrier pipe system. The cathodic-protection currents will no longer seek out the flaws, imperfections and holidays in the coating of the carrier pipe but will immediately flow to the bare low resistance-to-earth casing. This destroys the effectiveness of cathodic protection on many miles of coated carrier pipe on each side of the crossing.

If the short-circuited casing is well coated, it will receive cathodic protection itself, but will prevent protection of the carrier pipe within it. However, it will not penalize the protection on the balance of the line. This, then, resolves itself into a case of accidentally giving cathodic protection to the coated casing but thereby preventing protection on the encased carrier pipe, which is, after all, by far the more important member.



DIRECT CONNECTED 8 by 6-in. centrifugal pump with GM671 diesel engine. This unit handles up to 1,400 g.p.m. at 45 to 60 psi. It handles mud-mixing chores, tank rolling, and degassing. Note large-diameter suction, discharge lines.



V-BELT DRIVE, out of picture to left, couples this centrifugal mud pump to a slow-speed gas engine. Speed increase in belt drive turns pump at high enough speed for good efficiency. This package is on gas-powered rig.

MANUAL MUD HOPPER is operated with a 6-in. supply line from centrifugal pump. Line swages to 2½ in. for hopper's jet. Note the 6-in. union in right foreground; it is for line which goes to bulk hopper. Note also 45° turns in discharge line.

AGITATING TANKS, centrifugal pump handles all weighting and lost-circulation materials. This 200-bbl. tank has 6-in. line from pump with 3-in. guns top and bottom. Agitation of mud in tank corner shows efficiency of submarine guns.

On land rigs . . .

Centrifugal mud pumps are big money

- Centrifugal pumps can be used on the drilling rig to operate the mud hoppers, agitate tanks, supercharge pumps and operate other equipment such as degassers and desanders.

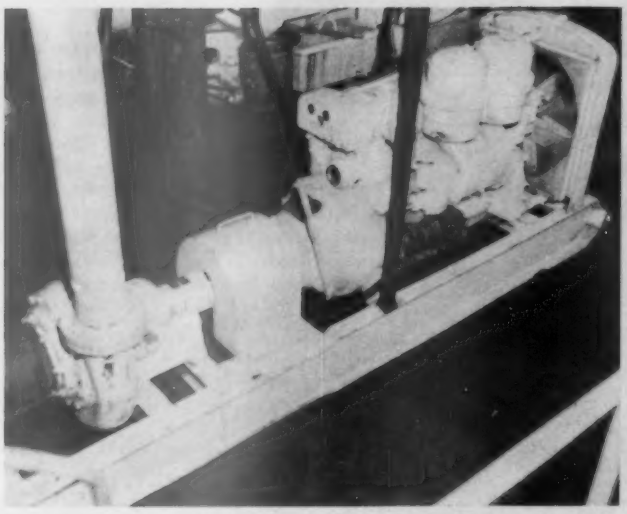
- These pumps are not only cheaper to buy than conventional reciprocating mud-mixing models, they are also cheaper and more flexible in operation.

- This article tells how a major drilling contractor applies centrifugal mud pumps to his rigs.

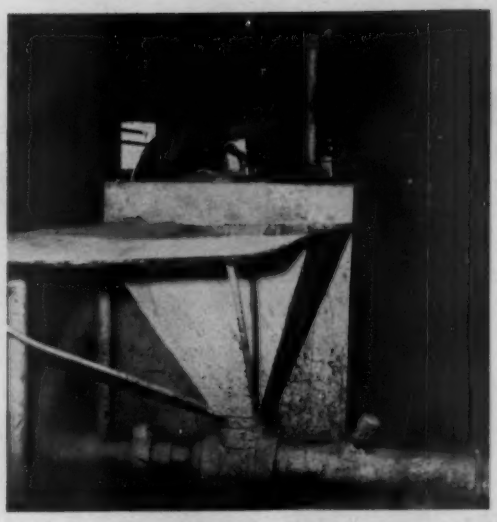
BY FOSTER MANNING
Division Engineer, Delta Drilling Co.
New Orleans.

FOR MORE than 2 years, Delta Drilling Co.'s Gulf Coast division has used centrifugal mud pumps to:

1. Run manual and bulk hoppers.
2. Agitate tanks.
3. Supercharge pumps.
4. Operate desanders.
5. Operate degassers.

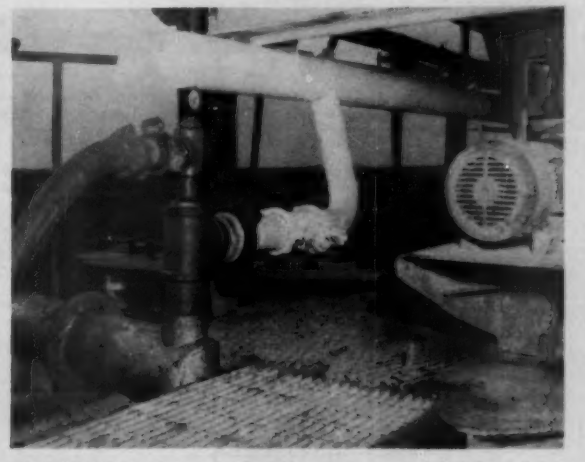


PIPING LAYOUT used by Delta Drilling Co. on its land Rig 17 which operates in South Louisiana. Use of inexpensive centrifugal pump and low-pressure piping makes important saving over using conventional piston-type mud-mixing pump.



HIGH VOLUME centrifugal pump is direct connected to diesel engine on inland drilling barge. This unit operates the mud hopper, feeds the degasser, and supercharges the main rig pumps.

FOUR-INCH SUPPLY LINE and 2-in. jet are features of this manual mud hopper on barge. Note that valve in 4-in. supply line is placed close to 6-in. main-supply line. Also, 4-in. line is run as nearly direct as possible to avoid unnecessary bends.



SUPERCHARGING main mud pumps on inland drilling barge. Six-inch line coming off main lines uses 90° weld ell to make a sweep tee for smoother flow of fluid into pump. Swage at upper right to 4-in. with valve is for line to supply water for cement units.

. . . and on barge rigs . . .

savers for Gulf Coast drillers

These centrifugal pumps have been quite successful; they are being chosen to replace the reciprocating pumps because of their:

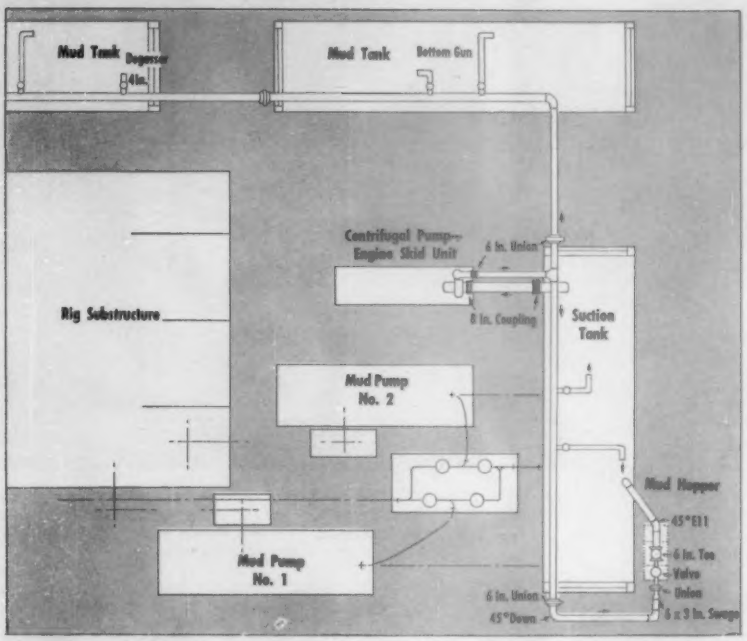
1. Lower purchase price.
2. Cheaper piping which is practical because of the high volume and low pressure.
3. Smaller size and lighter weight.
4. Need for less horsepower.
5. Ease of unitizel skid mounting when direct-connected to high-speed engines.
6. Inexpensive operation.
7. Greater capacity to weight up mud fast in emergencies.

It costs only about $4,500, including labor, to rig up a 6 by 8-in. centrifugal pump with a 120 continuous-horsepower engine, coupling, skid, and piping. Moreover, this unit can be installed in such a way that it can be used to mix mud, agitate tanks, supercharge pumps, or run a degasser without any repiping.

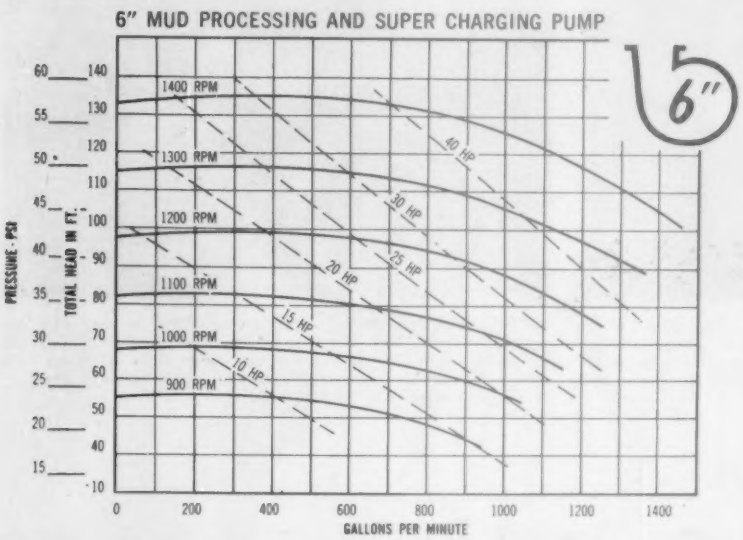
Because of this low cost and flexibility, centrifugal pumps are rapidly gaining popularity over the old-style duplex, reciprocating mud-mixing pump.

Points to watch. Here are a few precautions to observe when building a low-pressure mud system:

1. Do not underestimate horsepower requirement. An underpowered centrifugal pump cannot perform as efficiently as correctly sized equipment.
2. Skid mount and unitize pump and engine as compactly as possible for easy handling.
3. Keep suction lines short and



Land rig Operating degasser is done by fluid coming from 4-in. supply line which branches off main 6-in. line. Jet is 2-in. Delta Drilling Co. several years ago pioneered use of centrifugal-pump-feed desanders among drilling contractors. Fig. 9.



Barge rig Pump curve for 8 by 6-in. model gives pressure and volume which unit can handle at various pump speeds and horsepower inputs. Curve is based on water with specific-gravity of 1.0; it is not for latest model but is typical of those already in use by Delta.

avoid 90° turns if possible. If a 90° ell is used on the suction, it should be at least 24 in. from the pump.

4. Run a standard 6-in. main line the full length of the mud tanks to the points where mud will be taken off.

5. The 4-in. line coming off the main 6-in. should be at a 45° angle if possible. After necessary bends, swage to 2½-in. line approximately 18 in. from the hopper. Go straight into the 4-in. tee at the base of the hopper with about 1 in. of the 2½-in. jet visible inside the hopper. From the hopper, use a 4-in. discharge line with 45° ells back to the mud tank. (Note: if the hopper is more than 20 ft. from the main line, or if a bulk hopper is used, fluid-supply line should be 6-in. instead of 4-in.)

6. For agitating tanks, put two 2½-in. lines (with valves) from the main line to the bottom of the suction tank. Use 90° ells and nipples 8-in. long for jets. These two jets should be left open when mixing mud. Use 3-in. lines in all other tanks as desired with 3-in. jets.

7. A 6-in. line must be used for supercharging a reciprocating pump. Put the valve in this line close to the main line and keep the pump line short and straight. Let the 6-in. line enter the reciprocating-pump suction angled toward the pump. Such supercharging is very effective when the mud is gas cut or if it contains lost-circulation material.

8. A 4-in. line (with valve) coming off the main line and going into a 2 in. jet at the degasser has been adequate for the Gulf Coast.

9. Because this is a high-volume system, in no case should a miter-cut ell be used. Standard weld fittings allow smoother flow of more fluid. For ease in handling, low-pressure unions or couplings may be used where necessary.

Cost of operation. Most of Delta's power rigs on the Gulf Coast are equipped with centrifugal mud pumps for desanding, mud processing, and degassing; some also supercharge. Here is a typical comparison of the operating costs before and after these centrifugal units were installed. Before, one rig had its two main mud pumps and an independently driven reciprocating mixing pump. This independently driven unit was replaced by a centrifugal unit.

In the next 2 years total pump operating cost was 21% less than during the previous 2 years with the reciprocating mixing pump. Moreover, 14% less total fuel was required to run the rig.

Another example is a small (900-hp.) rig. It had one pump for drilling and one independently powered pump for standby and mud mixing. Then, an independently driven 8 by 6 centrifugal was installed to mix mud and gun-roll the tanks. After this, the standby pump could be kept ready for service on the hole.

To operate the three pumps for 24 months cost 6% less than operating the two pumps in the previous 24 months. And over-all fuel cost was actually 11% lower with the three pumps than with the two pumps.

Acknowledgment

The author expresses his appreciation to Harold Starr, of Byron Jackson Tools, Inc., New Orleans. For 2½ years, Starr assisted in the development of the centrifugal mud pump system used by Delta Drilling and it would not have been possible without his work.

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Where to find enthalpy charts of petroleum fractions

Will you please direct me to references where I can find (1) curves of enthalpy versus temperature for crude oils and their fractions for the liquid phase, the saturated vapor-phase, and two-phase systems at different percentages vaporized, (2) curves of enthalpy versus temperature at different pressures, and (3) curves of specific gravity versus pressure at different percentages vaporized? A.C.

Although enthalpy charts are used extensively for computations involving pure compounds such as the hydrocarbon gases, the industry has not found the use or construction of such charts for crude oils or even relatively simple mixtures such as natural gas, to be practical.

The composition of crude oils ranges so widely because of different boiling ranges and different kinds of hydrocarbons, that the common procedure has been to work with total liquid heats and total vapor heats at atmospheric pressure, apply approximate corrections for chemical composition, and then apply corrections for pressure. Adequate charts could possibly be devised were it not for the complication with the kind of vaporization practiced.

In mixtures, different heat quantities are found depending on the way the material is vaporized, that is (1) by equilibrium vaporization, (2) differential vaporization, or (3) various degrees of fractionation tending toward the separation of pure compounds.

Perhaps the most widely used enthalpy chart is the so-called "Shell Chart" which is shown as Fig. 5-3 following page 170 of the Fourth Edition of Petroleum Refinery Engineering (McGraw-Hill Book Co., Inc., N. Y., 1958). It presents atmospheric-pressure heat quantities and a method of correcting the heat content of vapor for the effect of pressure. Twelve charts of the total heats of light vapors (16-120 mol. wt.) are published in the Engineering Data Book of the Natural Gasoline Supply Men's Association (Kennedy Building, Tulsa) and these extend from saturated vapors to a pressure of 2,000 psia.

Enthalpy charts of petroleum fractions (11 and 12 characterization factor) at 100° F. intervals between 200° and 800° F. are shown in "Data Book on Hydrocarbons," by J. B. Maxwell (Standard Oil Co. of New Jersey research department) which is published by the D. Van Nostrand Co., Inc. Percentages vaporized are not indicated (except zero and 100%) because the method of vaporization would have to be defined.

M. Van Winkle introduced the effect of boiling range (or slope of distillation curve) when employing equilibrium (or flash) vaporization in three papers in the Petroleum Refiner (June-August 1948). These do not contain exactly what you desire but they indicate the complexity of the entire problem.

From all of the above, it is clear that charts of specific gravity or density are not practical. None has been noted in the literature.

Most of the difficulties in preparing enthalpy charts, etc., arise because mixtures behave differently from pure compounds. Unfortunately, our basic science or engineering courses in the universities usually do not cover the behavior of mixtures in an adequate way, and thus such knowledge must be developed to a large extent within each industry in meeting its own particular problems.

References on desalting crude oil

We are very much interested in additional information about the processes and procedures used in desalting crude oil, more complete information than in your Process Costimating issue of March 30, 1959, in The Oil and Gas Journal. S. L. S.

The resolving of crude-oil emulsions is both so simple and so difficult that not many complete discussions are available. Discussions of the physical laws governing the breaking of emulsions are not very practical and the practice of settling rests to a large extent on empirical data.

References are listed here. The best treatment of the subject is probably the booklet ($3.00) listed as Reference 13, and considerable empirical design data are given in Petroleum Refinery Engineering (Ref. 12).

References

1. Anon., "Kansas Refinery Desalts . . . with Spent Caustic"; The Oil and Gas Journal, Aug. 10, 1953, p. 123.
2. Anon., "Shell Designs Its Own Electric Dehydrators"; Petroleo Interamericano, January 1955, p. 44.
3. Anon., (Visco Products Co.) "Crude-Oil Desalting Process"; Pet. Refiner, Sept. 1948, p. 220.
4. Armistead, Geo., Jr., "Methods Used to Remove Salt . . .," Petroleo Interamericano, May 1949, p. 57.
5. Foster, Arch., "Desalting Crude Oil"; Pet. Engineer, Aug. 1951.
6. Hayes et al., "Commercial Desalting . . . Fiberglass as a Contacting Agent," Chem. Eng. Progress, April 1949, p. 235.
7. Kalichevsky, V A, "Oil-Water Emulsions"; Pet. Engineer, Aug. 1955, p. C-21.
8. Kirkpatrick, W. H., "Crude-Oil Emulsions"; Pet. Refiner, Nov. 1948, p. 142.
9. Koenig, E. A., "How Pressure Settling Tanks Function"; The Oil and Gas Journal, Oct. 4, 1951, p. 296.
10. Nelson, W. L., "Salt Content of Crude Oil," The Oil and Gas Journal, Jan. 20, 1958, p. 155.
11. Nelson, W. L., "Over-all Plant Costs"; Costimating No. 26, The Oil and Gas Journal, Mar. 11, 1957.
12. Nelson, W. L., Petroleum Refinery Engineering, fourth edition, p. 265-268, McGraw-Hill Book Co., Inc., N. Y., 1958.
13. Petreco Manual, "Impurities in Petroleum," Petrolite Corp., Long Beach, Calif., 1958.
14. Waterman and Moechel, "Crude-Oil Desalting," Refining Engineer, Oct. 1957, p. C-20.

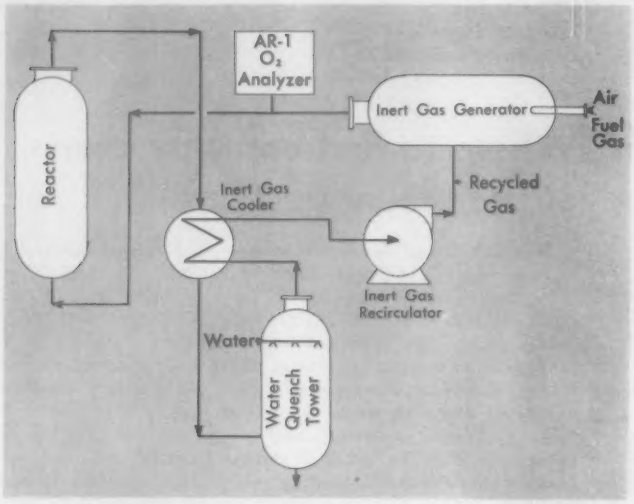
References of manufacture of hydrazine

Has anything been published on the processing operations by which hydrazine is manufactured commercially? R. G. H.

Scarcely anything has been published on commercial operations and nearly all of the references appear to apply to the Mathies Chemical Corp., plant at Lake Charles, La.

1. Anon.: Hydrazine Production Started . . ., Chem. & Eng. News, July 20, 1953, p. 2980.
2. Anon.: Hydrazine (process issue), Pet. Refiner, Nov. 1953, p. 180.
3. Sittig, M.: The Petrochemical Engineer Looks at Rocket Fuels, Pet Refiner, May 1951, p. 114.
4. Troyan, J. E.: Properties, Production, and Uses of Hydrazine, Ind. Eng. Chem., Dec. 1953, p. 2,608.

Unfriendly factors cause trouble in process instruments



INERT GAS SYSTEM used during regeneration of catalyst. Fig. 1.

A process engineer explains why instruments—new and old—sometimes fail to operate as they should.

BY CLARENCE R. SKALNIK

WHY will an instrument work well in one plant and fail miserably in another?

Not only is this experienced with the newer instruments, but with the older, established ones as well. All such difficulties primarily are results of some unfriendly factor in the instrument's environment. This can be unfriendly maintenance, an unfriendly element in the process, or an unfriendly element in the instrument itself, such as a faulty part.

In this article are case histories of some typical problems and a suggested solution for each.

Heated Filter

In one case an analyzer recorded the quantity of oxygen in the outlet stream from an inert-gas generator (Fig. 1). The generator is used during the regeneration of reactor catalyst at which time knowledge of the oxygen content of the gas is particularly important.

Shortly after the process unit came onstream a sample of the inert gas was checked for oxygen with an Orsat. The results were disappointing as they did not reflect the reading of the oxygen analyzer. After failing repeated checks the analyzer was dismantled for inspection.

How analyzer works. The primary element of the analyzer consists of two separate cells exposed to the gas sample. A strong magnetic field is produced around one of these cells by a permanent magnet. However, each of the two cells contain identical resistors, both of which are heated by passing an electrical current through them. These two resistors are connected electrically so that each one forms a leg of a Wheatstone bridge circuit. This is shown in Fig. 2.

The principle of operation is based on the fact that the dielectric constant of oxygen varies with temperature, and as oxygen is heated it becomes less magnetic. Therefore, the oxygen-bearing gas is first attracted into the magnetic field surrounding one of the heated resistors. In so doing, the oxygen is heated and rapidly loses its magnetism (in proportion to the square of its temperature rise) and passes on out of the cell to be replaced by cooler, more magnetic oxygen.

This action cools and therefore changes the value of the resistor in the magnetic field, and thus electrically unbalances the bridge circuit. This bridge circuit is connected into the recording system where the electrical unbalance is amplified and calibrated to record in per cent oxygen. The heated resistor in the other cell serves only as a reference leg of the bridge circuit.

Black coating. Inspection of the two cells revealed that each heated resistor and its adjacent cell wall was covered with a black coating that first appeared to be products of combustion. However, the coating could not be removed with hydrocarbon solvents or water. Replacement cells became similarly affected after a few hours operation, and the analyzer would become unreliable rapidly.

The source of the black substance in the cells was a mystery because the standard sample filter appeared to be doing a good job of removing soot, loose scale, and corrosion products that entered the sample line.

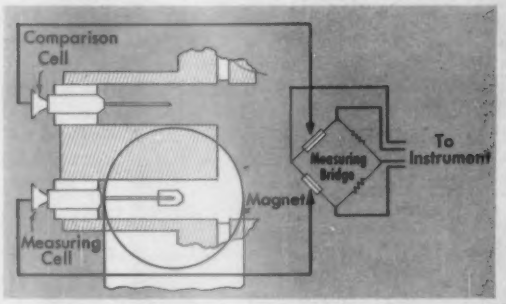
At this point factory representatives were called in on the problem. They found that the standard solution of sulfuric acid-potassium chromate normally used to clean these cells had no effect on the coating. It was necessary to use concentrated hydrochloric acid before the cells could be cleaned enough to meet factory calibration specifications.

Analysis of the black residue at the factory revealed that iron was present, and though the residue could not be identified entirely, it was believed to be formed by the decomposition of iron carbonyl. It was theorized that the iron carbonyl compound was formed in the process by the reaction

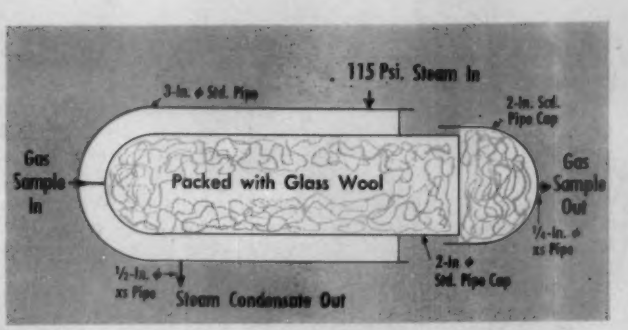
Paper presented at annual instrumentation symposium, Ruston, La., November 3, 1960.

About the author...

CLARENCE R. SKALNIK is senior construction and maintenance engineer, American Oil Co. refinery, Texas City, Tex. He was employed by American in 1947 following graduation from Texas A & M College with a BS in mechanical engineering. He has been in American's design-engineering division since 1948. Skalnik is a member of the Instrument Society of America and a registered professional engineer.



MEASUREMENT CELL for oxygen analyzer uses two resistors in Wheatstone bridge circuit. Fig. 2.



HEATED FILTER WAS INSTALLED to remove contaminating material from analyzer atmosphere. Fig. 3.

of iron in the form of dust with carbon or carbon monoxide.

Heated filter indicated. Since the standard cloth-type filter appeared to have no effect on removing the contaminant, and heat evidently was a factor because the heated resistors were the worst affected, a heated filter appeared to be the most logical solution. Therefore, one was fabricated and installed using a 1-ft. piece of 2-in.-diameter pipe filled with glass wool and steam-jacketed with a piece of 3-in. pipe as shown in Fig. 3.

A temperature of over 300° F. was recommended, so 115-psi. steam with a saturated temperature of 347° F. was used in the jacket as the heating medium. A second consideration to make the filter small, since the sample goes through the analyzer at about 200 cc. per minute. Therefore, the larger the volume of the sample system the longer is the delay for the oxygen analyzer to record a change in per cent oxygen in the process stream.

The instrument now operates satisfactorily with a minimum of maintenance, and it is necessary to replace the glass wool in the filter only about every 3 months.

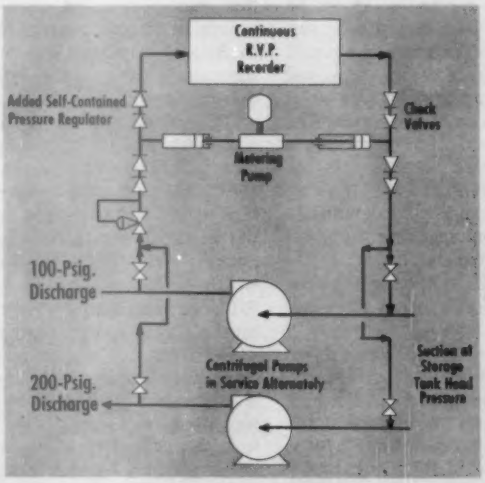
Other use. Another use for the heated filter was later found in the sample system for a gas chromatograph. It was a three-stream analyzer in which each stream was sampled in rotation by a complicated automatic-switching arrangement. One of the stream samples entered the instrument as a liquid and was filtered and then vaporized before it passed through the chemically packed ¼-in. o.d. tubing column.

At times this column became plugged after only a few days' use and had to be recharged. Since the existing filter and vaporizer were custom-built into the instrument, a shop-made heated filter was installed in the liquid-sample line upstream of the instrument. The heated filter now vaporized the sample, and it was found much more successful to remove the contaminating solids from the gas than from the liquid as was attempted previously. Also, most of the contaminating solids are left behind in the filter when the liquid is vaporized.

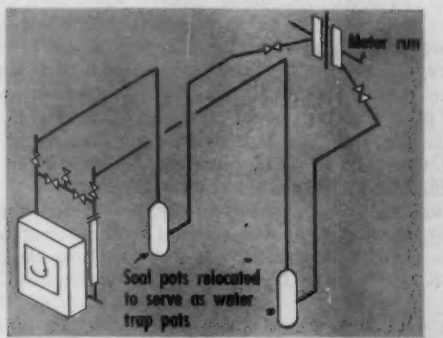
Metering Pump Suction

A Reid-vapor-pressure recorder was installed to permit it to alternate between two nearly identical services. The piping was arranged so that the instrument could sample the discharge of any one of four centrifugal pumps (two pumps to each service). As shown in Fig. 4, one unit of the instrument's metering pump takes suction at a sample point in the discharge of the centrifugal process pump and injects the sample at a rate of 60 cc. per minute into the instrument. The other pumping unit of the metering pump then returns the analyzed sample back to the process at a point in the suction piping of the same centrifugal pump.

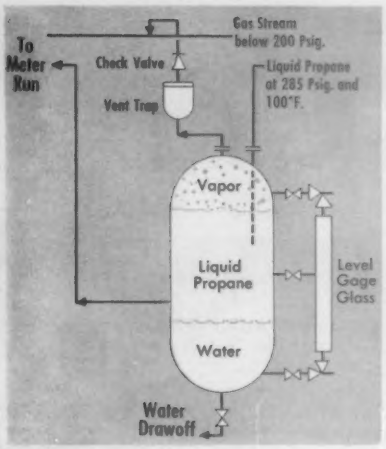
A characteristic of the instrument is that its accuracy is impaired if the sample flow deviates appreciably from 60 cc. per minute. The uniform rate is maintained by the small reciprocating metering pump using check valves in both the suction and discharge lines to maintain flow in only one direction. Since check valves seldom have a perfectly tight shutoff to reverse flow, adjusting the sample to 60 cc. per minute during one service at 100-psi. pressure was never duplicated when



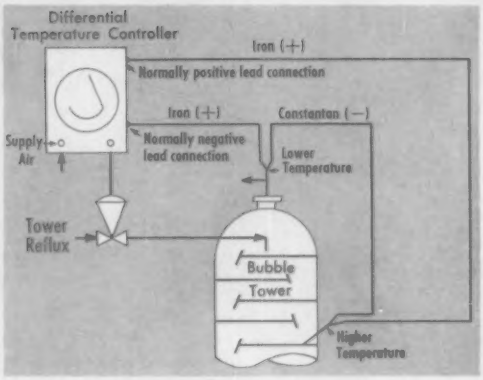
METERING PUMP PUSHES SAMPLE through continuous RVP recorder at 60 cc. per minute. Fig. 4.



SEAL POTS WERE RELOCATED on liquid-propane meter to serve as water-trapout pots. Fig. 5.



SMALL DRUM upstream of meter run provides for water dropout and vapor trapout. Fig. 6.



DIFFERENTIAL-TEMPERATURE CONTROL allows operators to maintain constant temperature difference between two points on fractionating tower. Fig. 7.

the alternate service at 200-psi. pressure was applied.

Once this difficulty was found to be caused by differences in pressure between the two services and not by the composition of the process fluid being sampled, a small pressure regulator in the sample-pump suction provided the solution. Then regardless of the variation of sample pressure, the pressure at the sample metering pump was the same. This insured that the flow calibration for one service would be sufficiently accurate for the alternate service without recalibration.

Metering Liquid Propane

Liquid-propane product from two process units was combined to form a single product stream. This stream was metered with a conventional orifice-type recording flowmeter with a horizontal meter run. The instrument chart indicated that the flow rate of this combined stream occasionally fluctuated wildly, and the pen oscillations would paint an intermittent band on the chart. Integrating these charts to determine daily yields was a difficult task. Though the individual unit meters on the streams before they combined were affected to a lesser degree, a total of their readings seldom checked closely with the combined-stream meter being investigated.

During routine checks it was also found that the instrument always drifted from zero. An investigation revealed the standard water-glycerine sealing liquid had become diluted unequally and the specific gravity of the sealing liquid in each of the seal pots was different. This accounted for the zero drift.

Water solubility. Since water was occasionally entering the analyzing chamber of the gravitometer located immediately downstream of the meter run, it was reasoned that water was diluting the sealing liquid. The presence of the water was a mild mystery because if any had entered the process it would have been promptly removed at the process unit. Table 1 provided the clue, however, in that it showed the amount of water soluble in liquid propane at various temperatures.

TABLE 1—WATER SOLUBLE IN LIQUID PROPANE

Temp. °F.	% by wt.
32	0.006
40	0.008
50	0.011
60	0.016
70	0.022
80	0.029
90	0.038
100	0.049

Based on an average daily flow of about 100 lb. per minute and a temperature drop along the line from 100° to 90° F., nearly 16 lb. or almost 2 gal. of water would drop out of the propane every day. This amount would vary from day to day, and should the product temperature drop to 80° F. at the meter, the amount of water rejected would be twice as much. The propane usually left the process units at about 100° F., and would cool down to approach ambient temperature before reaching the combined stream flowmeter.

One of the units supplying the propane is about 5,500 ft. from the flowmeter.

Though the amount of water dropping out of solution was not enough to cause the rapid pen oscillations, it was decided to try to eliminate the zero drift. The process liquid (propane) was substituted for the standard water-glycerine seal, and the seal pots were relocated to below the instrument to serve as water-trapout pots (Fig. 5).

This removed all the water that entered the instrument lead lines and essentially solved the zero-drift problem. Still, a small inconsequential amount of water continued to be found floating on top of the mercury in the meter bodies during routine checks. This water probably came from chilling the propane in the lead lines above the instrument during the evenings.

Vapor flashing. As expected, however, the primary problem of the intermittently painted chart still persisted. Though the symptoms pointed the finger of suspicion at vapors flashing across the orifice, the operating conditions of 285 psig. and 100° F. seemed to preclude this possibility. These operating conditions are well within the limits required to maintain propane as a stable liquid. But a search of the chemical-analysis record for this stream revealed that over a 3-month period an average of 15% of the stream by weight was composed of material with a lower boiling point than propane.

This meant that the lighter material was bubbling out of the liquid much like the bubbles forming in a carbonated drink. An accumulation of bubbles would form a vapor space above the liquid in the piping. These vapor pockets built up at the orifice plate which served as a dam in the line. When a sufficient quantity of gas built up it spilled through the orifice. This increased the velocity of the fluid through the orifice and created a larger differential pressure to be measured across the orifice taps. Thus a false indication of increased flow was registered by the flowmeter.

Because of liquid surface tension the gas did not flow smoothly through the

orifice, but passed through in various-sized enlarged bubbles. This accounted for the previously mentioned flowmeter recording-pen oscillations.

The next problem was to remove this material from the stream, since it was determined that to increase the pressure of the stream to 750 psig. would only minimize the vaporization and not eliminate the problem. Besides, the additional pumps required would be too expensive. Refrigerating the stream to lower the temperature to keep the material in solution was also too expensive to consider seriously.

However, it was determined that the most economical solution would be to install a small drum about 2 ft. in diameter and 4 ft. high upstream of the meter run (Fig. 6). Here not only would any water present be dropped out, but the accumulated vapors that were bubbling out of the liquid would be trapped in the dome of the drum. Then the vapors could be disposed of through a standard vent trap (similar in principle but operating opposite to a bucket-type condensate trap) to a fuel or process gas stream of lower pressure.

Replacing a Temperature Controller

The problem was to replace an antiquated differential-temperature recording controller that was worn beyond economical repair with a used but more modern instrument existing in surplus stock. The instrument was to control the differential temperature across the top four trays of an ammonia-fractionating column to give the optimum quality and quantity of dry ammonia. A thermowell in the cooler vapor overhead line and another thermowell in the warmer liquid in the fifth tray from the top were the two temperature-sensing points.

Normally replacing one instrument with another in the same service requires only different mounting dimensions. However, in this case the original instrument was a resistance bulb type, and the replacement instrument was a potentiometer or thermocouple type that had been used to sense the millivolt signal from a single thermocouple.

The first step was to install a kit of parts ordered from the manufacturer to change the range of the surplus instrument from 0°-600° F. to a range of 0°-100° F. (calibrated for iron-constantan thermocouples).

The next step was to analyze the thermocouple circuit. Since the output from a thermocouple is pure direct current the same laws of physics apply whereby opposing direct current cancel each other and the resulting potential is a value that is the difference of the two. Therefore, a hookup as shown in Fig. 7 is possible.

The important thing to remember here is that the two thermocouples are at a different potential and the instrument is receiving this difference in potential through the thermocouple lead wires as millivolts of direct current just as if only a single thermocouple were involved.

Since the two thermocouples are at different potentials each must be wrapped with an insulating tape and the bare thermocouple prevented from touching the metal wall of the thermowell. Otherwise the interconnecting metal will create a short circuit between the thermocouples and they will be at the same electrical potential. This would cause the instrument to have a constant erroneous reading of 0° F. differential temperature.

To improve heat transmission from the thermowell to the thermocouple and reduce measurement lag, clean transformer oil was poured into the wells. The use of oil is possible only where the thermowells are installed in a vertical plane or at a sufficient angle to trap the oil in the bottom of the well. Another consideration is the heat limitations of the particular oil being used, otherwise most of it may boil away and only a coke residue will remain to cement the thermocouple to the well.

Nelson Refinery Cost Indexes

Published in the first issue each month in the Technology-Operations Section. Compiled by W. L. Nelson, Technical Editor and petroleum refinery consultant, Tulsa.

Charts of the indexes are published each year in a late January or early February issue.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issues of the month of January, April, July, and October.

Refinery Construction Cost Index (1946 Basis)

Explained on page 101 of the issue of August 5, 1957.

	1950	1954	1957	1958	1959	July 1960
Pumps, compressors, etc.	138.2	166.5	206.7	214.7	226.5	228.6
Electrical machinery	134.9	160.0	188.9	192.7	195.8	195.0
Internal-combustion engines	126.0	150.5	173.9	178.3	178.5	179.0
Instruments	127.8	154.6	187.4	194.9	201.0	204.3
Heat exchangers	140.0	171.7	203.6	181.2	178.9	195.7
Miscellaneous equipment average	*126.2	160.7	192.1	192.4	196.1	200.5
Materials component	149.5	174.6	201.9	204.2	207.8	207.4
Labor component	144.0	183.3	208.6	220.4	231.6	244.3
Nelson construction index	146.2	179.8	205.9	213.9	222.1	229.5

*Used in computing the Nelson Index until April 1952.

Refinery Operating Cost Indexes (1956 Basis)

Explained on page 171 of the issue of June 1, 1959.

	1946	1952	1954	1958	1959	June 1960
Fuel cost	49.6	81.0	86.5	102.1	103.5	108.9
Labor cost	73.1	88.7	90.9	105.0	102.3	102.2
Wages	52.4	81.5	88.7	105.4	111.5	113.8
Productivity	68.3	90.2	97.1	100.3	109.0	111.2
Investment, maintenance, etc.	51.2	83.6	92.0	109.5	113.7	117.1
Chemicals cost	37.0	72.1	85.7	104.4	107.8	115.0
Operating cost indexes:						
Refinery	58.5	80.5	88.7	105.8	106.8	109.7
Process units‡	62.9	82.2	88.4	105.8	106.0	108.0

‡Add separate index for chemicals, if any are used.

BY JOSEPH ZABA

OIL-WELL PUMPING PART 25

Why correct plunger size is important

SELECTION of proper pump size plays an important part in the over-all design of a pumping installation. Under a given set of pumping conditions the size of the plunger determines both the pump displacement and the loads imposed on the equipment. A plunger too small may fail to exhaust the producing possibilities of a well. A plunger too large may impose excessive loads on equipment and may unfavorably affect the pump displacement because of rod stretch from these loads. For a given pumping installation, there is a certain size of plunger which will be best from the standpoint of the over-all efficiency. (Theory and field experience show that more production is being lost by use of plungers which are too large than too small.)

Formulas can be used to find the plunger stroke for different sized plungers, and the corresponding loads and displacements. By comparing results from several calculations, optimum size plunger can be found.[1]

Also, formulas have been developed for direct calculation, such as the C. J. Coberly formula for plunger area for maximum production:[2]

$$A = \frac{S_p E}{10.39\ GL^2\ [(1/a_r) + (1/a_t)]} \quad (1)$$

Where:

A = plunger area for maximum production, sq. in.
S_p = polished-rod stroke, in.
E = modulus of elasticity.
G = specific gravity of the pumped fluid.
L = length of rod string, ft.
a_r = area of rods, sq. in.
a_t = area of metal in tubing, sq. in.

The above formula covers the case of free tubing. For anchored tubing:

$$A = \frac{S_p E a_r}{10.39\ GL^2} \quad (2)$$

For fluid of specific gravity of 1.0 and expressing the length of rods in thousands of feet the formula may be simplified as follows:

For free tubing:

$$A = \frac{2.9\ S_p}{D^2\ [(1/a_r) + (1/a_t)]} \quad (3)$$

For anchored tubing:

$$A = \frac{2.9\ S_p\ a_r}{D^2} \quad (4)$$

Where:

D = length of rods, thousands of feet, and other symbols are as in preceding equations.

These formulas consider only the stretch of rods and tubing. To correct for overtravel Coberly suggests a correction factor by which the calculated plunger area must be multiplied:

$$F = 1 + \frac{2.4\ (DN)^2}{100{,}000} \quad (5)$$

Where:

F = correction factor.
N = s.p.m.

To find the size of plunger which would give the minimum peak polished-rod load for given conditions, including the rate of production, Emory N. Kemler derived some formulas based on the generally used formulas for finding the peak polished-rod load. For Slonneger's and Mill's load formulas, the respective equations for plunger size are:[3]

$$d = (KQ/210\ se)^{1/4} \quad (6)$$

and

$$d = (KQN/2{,}750\ se)^{1/4} \quad (7)$$

Where:

d = plunger diameter for minimum peak load, in.
K = weight per foot of sucker rods (average for tapered string), lb.
Q = rate of production.
s = specific gravity of pumped fluid.
e = volumetric efficiency of pump.
N = s.p.m.

Pump displacement. On a barrels per 24-hour basis, theoretical displacement of a sucker-rod pump can be found from this formula:

$$P = 0.148 \times S \times N \times A \quad (8)$$

Where:

P = displacement, barrels per 24 hours.
S = stroke, in.
N = s.p.m.
A = area of plunger, sq. in.

For any given plunger size the formula can be written:

$$P = C \times S \times N \quad (9)$$

where C is a constant. C-values of common plunger sizes are given in Table 9.

If S in the displacement formula is the polished-rod stroke, the result is the so-called "apparent" theoretical displacement. If it is actual plunger stroke, calculated or measured, result is actual theoretical displacement.

TABLE 9—CONSTANT C FOR CALCULATING THEORETICAL PUMP DISPLACEMENT

Plunger diameter (in.)	Constant C
3/4	0.066
15/16	0.102
1	0.116
1 1/16	0.132
1 1/4	0.182
1 1/2	0.262
1 3/4	0.358
1 25/32	0.370
2	0.465
2 1/4	0.590
2 1/2	0.732
2 3/4	0.878
3	1.049
3 1/4	1.231
3 1/2	1.428
3 3/4	1.640

The theoretical displacement assumes 100% volumetric efficiency of the pump. Actually this efficiency is controlled by a number of factors and only very seldom equals 100%.

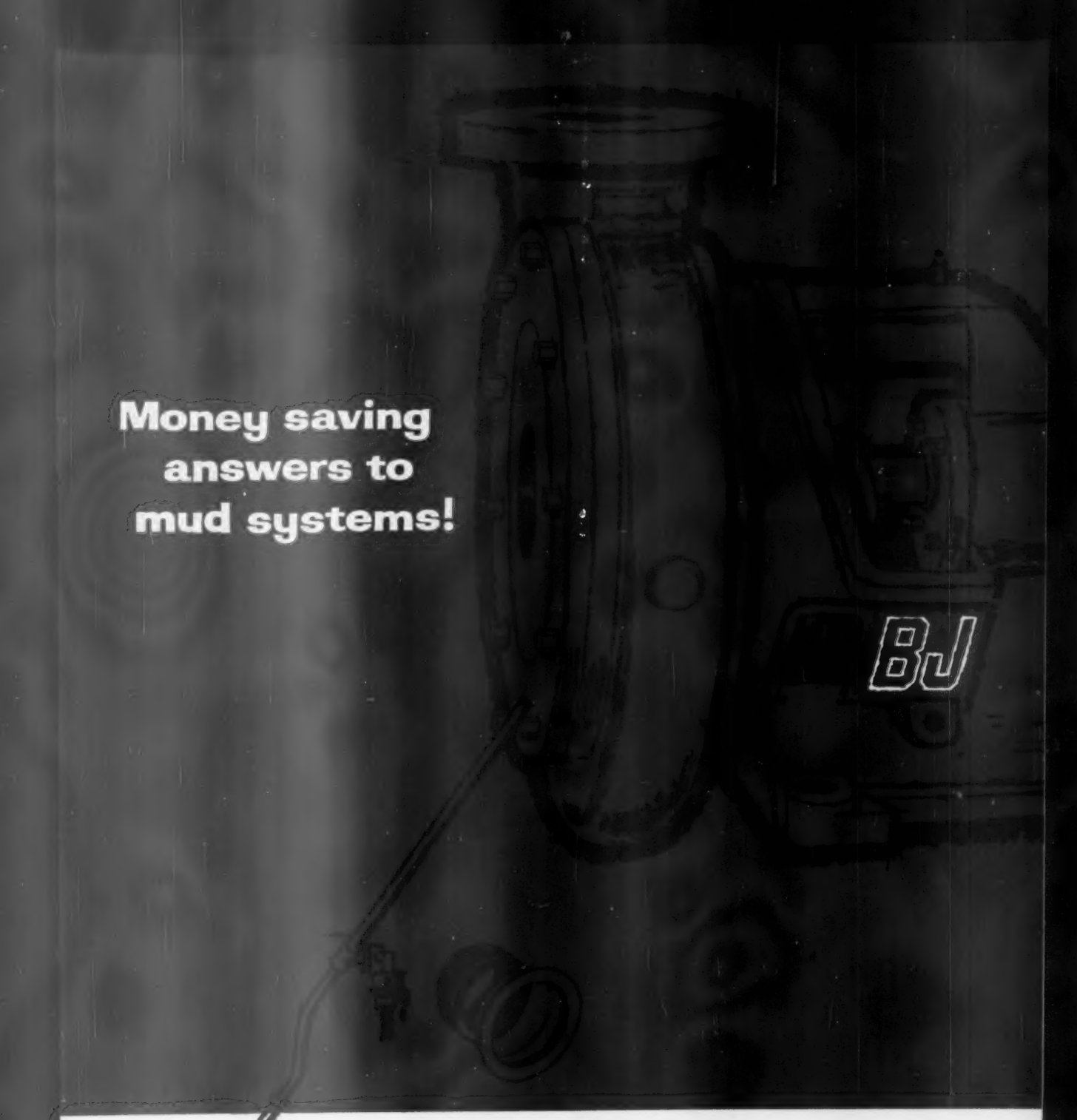
Volumetric efficiency. This is defined as the ratio of volume of stock-tank oil delivered to the pump's apparent or actual theoretical displacement. Efficiencies vary widely from a few to over 100%. The latter cases occur during the part-flowing part-pumping periods of the producing life of some of the wells. In calculations for normal pumping efficiencies of 80% are assumed.

The problem of sucker-rod-pump efficiencies has been a research subject for a long time. The factors, affecting the efficiencies, and considered in these studies, may be divided into groups: (1) properties of the pumped fluid including gas, (2) well characteristics such as depth, bottom-hole pressure, productivity index, (3) pump's submergence and characteristics of the pumping cycle, and (4) design and state of repair of the pump.

Of all these factors, gas, which must be handled by the pump, has probably the most pronounced effect on the efficiency and must be considered in more detail than the others.

Bibliography

1. D. O. Johnson, "Analysis of Optimum Sucker Rod Pumping": A paper presented before spring meeting of Petroleum Division of AIME, Dallas, May 1943.
2. C. J. Coberly, "Problems of Modern Deep-Well Pumping": A paper presented before spring meeting of ASME, Los Angeles, March 1938. See also The Oil and Gas Journal, May 12, 1938.
3. E. N. Kemler, "Selection of Pump Size for Optimum Sucker Rod Pumping Conditions": Oil Weekly, April 28, 1941.



Pumps, Tank Connectors, Mud Guns. Save money, save time, increase operating efficiency with mud system products engineered by Byron Jackson. Cut mud processing costs to the bone by using BJ Centrifugal Pumps to replace or supplement expensive reciprocating pumps. Total savings may run as high as 90%! For mud tank and slush pump hook-ups, you'll save with BJ Flex-Line and Flex-O Connectors. Flexible, versatile and easily installed, they provide a positive, leakproof seal... compensate for angular misalignments of up to 10°. And for more efficient mud mixing BJ offers ball-swivel and bottom type mud guns that give long, trouble-free service in all mud programs.

Send for bulletin (No. BJT-60-148), which gives details on reducing mud processing costs with BJ Centrifugal Pumps.

Byron Jackson Tools, Inc.
A SUBSIDIARY OF BORG-WARNER CORPORATION

P.O. Box 2017-A, Terminal Annex, Los Angeles 54 • P.O. Box 2198, Houston 1 • Export Address: 580 5th Ave., Suite 510, New York 36

BJ

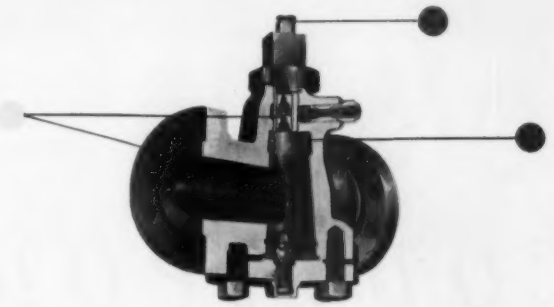
Sven Nordstrom (1881-1951) made world's first lubricated plug valve in 1914. First "lubricant" was a wickless mine candle compressed into the valve by a bolt. Most lubricated plug valves since then have been based on Nordstrom's original ideas.

he tore the wick from a candle

. . . and conceived a better valve for you

When Sven Nordstrom used a mine candle to lubricate his first lubricated plug valve, he created an entirely new valve concept . . . a valve that didn't rely for its effectiveness on wedging metal against metal.

At the time it was patented, in 1916, Nordstrom's valve was the most modern, advanced valve in the world. That is still true —for while the fundamentals have remained the same, Nordstrom's original patents have been continuously improved on through over 80 basically new patents. Over the last 44 years (and millions of valves) each innovation has helped people in a wide variety of industries solve new and even more difficult flow control problems. Look inside the modern Rockwell-Nordstrom valve, shown below, for just a few of the reasons why it will help you solve your flow control problems, too.



PERFECT APPLICATION OF A PRINCIPLE

- Lubricant quickly, easily injected through Rockwell fitting.
- Lubricant travels through Sealdport® system to create powerful seals against leakage and prevent metal-to-metal wear between plug and body . . . note seats never exposed to the line.
- Lubricant hydraulically jacks plug minutely from seat for instant quarter-turn operation.

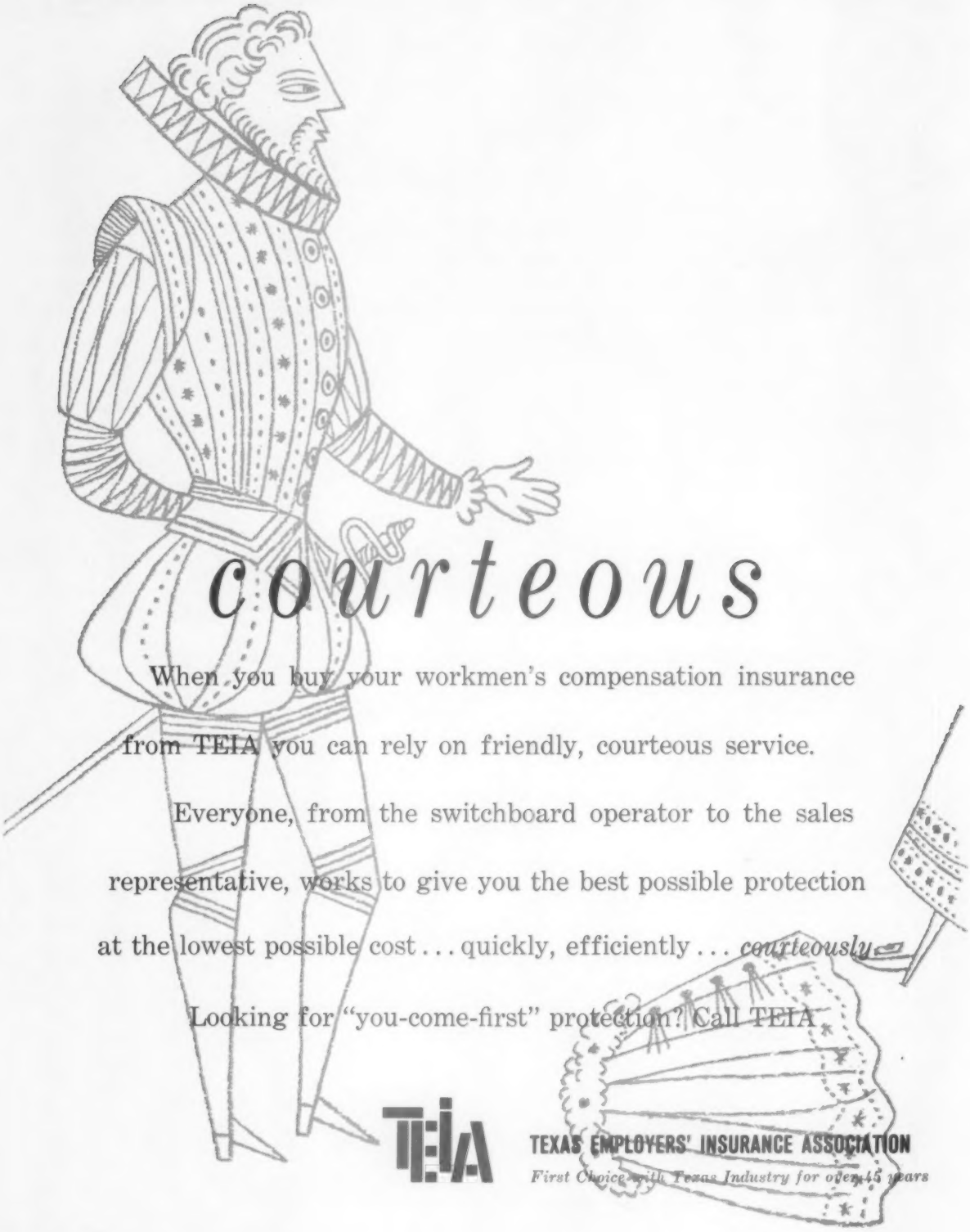
Rockwell-Nordstrom is the original and world's most complete line of lubricated plug valves. Available in sizes from ½" to 36" and pressures to 15,000 lb. For additional information, see your supplier or write: Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania. Canadian Valve Licensee: Peacock Brothers Limited. If you live outside the USA, write: Rockwell International S.A., Geneva, Switzerland.

Lubrication Makes The Difference

ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL



courteous

When you buy your workmen's compensation insurance from TEIA you can rely on friendly, courteous service.

Everyone, from the switchboard operator to the sales representative, works to give you the best possible protection at the lowest possible cost . . . quickly, efficiently . . . *courteously.*

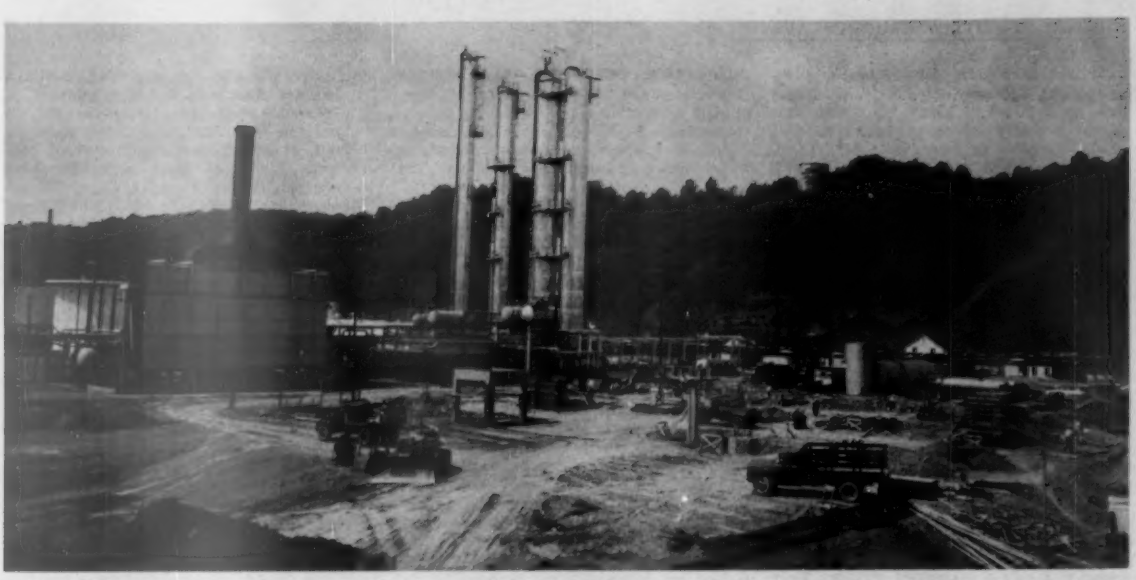
Looking for "you-come-first" protection? Call TEIA.

TEIA

TEXAS EMPLOYERS' INSURANCE ASSOCIATION

First Choice with Texas Industry for over 45 years

HOME OFFICE: DALLAS | 25 SERVICE OFFICES IN TEXAS | AUSTIN F. ALLEN, CHAIRMAN OF THE BOARD | BEN H. MITCHELL, PRESIDENT



THE SUDDEN SPURT in construction of petroleum naphthalene facilities includes Ashland Oil & Refining Co.'s new Hydeal unit at Catlettsburg, Ky. Capacity will be 75,000,000 lb. per year of naphthalene from naphtha fraction, and from 70,000 to 120,000 bbl. per year of benzene. Completion is scheduled first part of 1961.

JOURNAL PLANT CONSTRUCTION SURVEY

Petrochemicals still in building forefront

- Refinery report shows 41 projects under way or planned in U. S. and Canada. Petrochemical construction continues at high level with 98 projects. Giant Kansas plant highlights field-processing activity.

BY ROBERT B. BIZAL
Director, Editorial Research

NEW PROJECTS for expansion of petrochemical plant capacity in the U. S. and Canada far outnumber the combined activity in refinery and field-processing construction.

The Journal's new survey shows 98 petrochemical building programs planned or under way. The important fields of polyolefins, synthetic rubber, and styrene are well represented.

Highlighting refinery construction is the first use of the Lomax unit and the Isocracking process. Powerine Oil Co. is building the industry's first Lomax unit in Los Angeles. Standard Oil Co. of Ohio, Toledo, Ohio, and Tidewater Oil Co., Avon, Calif., have the first licenses to use the Isocracking process.

Among the 25 field-processing projects listed for the U. S. and Canada, the biggest news is the proposed 900-M.M.c.f.d. plant planned by Northern Gas Products Co. at Bushton, Kans. Northern Gas is a subsidiary of Northern Natural Gas Co.

Here is a complete rundown of current plant construction:

Refinery Construction

AMERICAN OIL CO., Texas City, is under way with a big construction program which includes a 150,000-bbl. per day crude unit; a 47,600-bbl. cat cracker; and a 14,600-bbl. alkylation unit. These will replace six units now in existence when the program is completed in early 1962. M. W. Kellogg Co., New York, has contract for crude unit and cat cracker. Fluor Corp., Ltd., Los Angeles, has contract for the alkylation unit. Program will increase crude-charging capacity by only 10,000 bbl. per day.

ASHLAND OIL & REFINING CO., Catlettsburg, Ky., is adding a 32,000-bbl. per day vacuum distillation unit, with completion set for spring 1961. It will replace three smaller vacuum units and will produce light and heavy gas oil for cat cracking charge stock, cylinder stock, and asphalt.

BRITISH AMERICAN OIL CO., LTD., Edmonton, Alta., will increase capacity from 8,500 bbl. per stream day to 13,500 bbl., with completion late 1960.

CANADIAN KODIAK REFINERIES, LTD., plans to build a refinery at The Pas, Man.

CONSUMERS' CO-OPERATIVE REFINERIES, LTD., Regina, Sask., is building a 3,000-bbl. Platformer and a 6,000-bbl. distillate Unifiner. Completion by Procon (Canada), Ltd., Toronto, is expected by end of December 1960.

DX SUNRAY OIL CO., Tulsa, is building an 85,000-bbl. distillation unit to replace five old ones having a combined capacity of 75,000 bbl. Foster Wheeler Corp., New York, has contract, with completion early 1962.

FARMERS UNION CENTRAL EXCHANGE, INC., Laurel, Mont., was scheduled to complete capacity increase from 20,000 to 25,000 bbl. per day in March 1961. Fresh-feed capacity of cat cracking operation will be increased from 8,000 to 10,000 bbl., and recycle capacity will be increased from 2,000 to 5,000 bbl.

FLORIDA OIL & REFINING CO. (Frontier Refining Co.) will build a new refin-

ery at a deep-water site on the St. Johns River at Jacksonville, Fla., with initial design capacity of 15,000 bbl. daily. Important units will be over-sized so that capacity could be enlarged to 25,000 bbl. per day. Units will include crude unit, splitter and straightrun stabilizer, delayed coker, fluid catalytic-cracker, Merox unit, and a Platformer-Unifiner.

GOLDEN BEAR OIL CO., Oildale, Calif., is studying feasibility of adding a 1,000-bbl. catalytic hydrogen treating unit for lubes. Project would not be undertaken before 1962.

GOLDEN EAGLE REFINING CO., Torrance, Calif., which has been acquired by the British company, Ultramar Co., Ltd., plans to increase capacity from 9,000 to 30,000 bbl. per day.

GOLDEN EAGLE REFINING CO. OF CANADA, a subsidiary of Ultramar Co., Ltd., plans to build a 7,500-bbl. refinery at St. Johns, Newfoundland, the first for that province.

GREAT LAKES CARBON CORP., Enid, Okla., plans a $3 to $5-million coke plant.

GREAT PLAINS REFINERY (formerly Queen City Oil & Refining Co.) at Dickinson, S. D., will be revamped and expanded, with completion in April 1961. Litwin Engineering Co., Wichita, Kans., has contract. Capacity will be increased from 2,500 to 4,500 bbl. daily.

GULF OIL CORP., Port Arthur, Tex., will complete installation of twin lube-oil units spring 1961. Each will have 6,500-bbl. capacity. Bechtel Corp., San Francisco, has contract.

HESS TRADING & TRANSPORT, INC., Sewaren, N. J., plans a new 30,000-bbl. fluid cat cracker, 15,000-bbl. Unifining unit, 40,000-bbl. vacuum unit and 2,500-bbl. sulfuric alkylation unit.

HUMBLE OIL & REFINING CO., ESSO STANDARD DIVISION, Baton Rouge, La., was scheduled to complete a 1,400-bbl. expansion in lube-oil capacity in December 1960, with the Esso staff doing the work.

At Bayonne, N. J., Esso was scheduled to complete an expansion project the fourth quarter 1960. This involves an increase in crude-charge capacity from 28,500 to 32,000 bbl. and vacuum capacity from 15,000 to 16,100 bbl. Bechtel Corp., San Francisco, is contractor.

HUMBLE OIL & REFINING CO., HUMBLE DIVISION, Baytown, Tex., is increasing vacuum capacity from 157,000 to 179,000 bbl. daily, with completion by Humble crews by March 1961. Catalytic hydrogen treating will be increased by 6,500 bbl. to 82,300 bbl. daily, with completion by January 1961.

HUSKY HI-POWER, INC., Cody, Wyo., will increase capacity from 7,200 to 9,000 bbl. daily in January 1961. A 2,500-bbl. gas-oil cracking unit, and a 700-bbl. sulfuric acid alkylation unit will also be added by January 1961.

IMPERIAL OIL, LTD., Sarnia, Ont., is adding a 32,000-bbl. Hydrofiner to treat furnace oils.

MOBIL OIL CO., Beaumont, Tex., is scheduled to complete a delayed-coking unit spring 1961. The unit will convert 20,000 bbl. daily of heavy oil to lighter ends.

MONARCH OIL CORP., plans to modernize the 5,000-bbl. refinery at Signal Hill, Calif., formerly owned by Olympic Refining Co. Facilities would produce kerosine, diesel fuel, solvents, lubricating-oil stocks, and asphalt.

NAPH-SOL REFINING CO., Muskegon, Mich., has tentative completion date of 1961 for new 5,000-bbl. Unifiner.

PHILLIPS PETROLEUM CO., Borger, Tex., is building a 25,000-bbl. heavy oil catalytic cracking unit, with completion in 1961. Contractor is M. W. Kellogg Co., New York.

POWERINE OIL CO., Santa Fe Springs (Los Angeles), Calif., is building the industry's first Lomax unit, a hydrocracking process which converts diesel oil and lower to gasoline. Process was developed by Universal Oil Products Co. The 2,200-bbl. unit will have yield of 2,537 bbl. daily. Also being added is a 3,000-bbl. Platformer, apparently to provide hydrogen for the Lomax unit.

RICHFIELD OIL CORP. plans a $50-million plant at Everett, Wash., with probable completion in 1965.

SHELL OIL CO., Wood River, Ill., was scheduled to complete a 25,000-bbl. Platformer in December 1960. Present capacity for Platforming is 43,000 bbl. Arthur G. McKee & Co., Cleveland, has contract.

SHELL OIL CO. OF CANADA, LTD., may build a 20,000-bbl. refinery at Bronte, Ont., near Toronto.

Shell is also considering construction of a plant in Alberta. It has taken option on a 310-acre site southeast of Calgary.

SIGNAL OIL & GAS CO., Houston, was scheduled to complete installation of a 19,000-bbl. fluid catalytic cracking unit early spring 1961. This will boost fluid cat cracking capacity to 39,000 bbl. at the plant. The unit was purchased from the closed American Oil Co. refinery at Destrehan, La. Contractor is Brown & Root, Inc., Houston.

At Huntington Beach, Signal has decided to build a grass-roots refinery rather than try to rebuild its old plant which was damaged by fire in 1957. New plant will have capacity of 20,000 to 25,000 bbl. daily, with design allowing expansion to 50,000 bbl. later. Construction to start first half 1961.

STANDARD OIL CO. OF CALIFORNIA recently completed the first units of its 35,000-bbl. plant near Honolulu, Hawaii, but the following downstream units are not scheduled for completion until mid-1962: 13,000-bbl. fluid cat cracker with recycling capacity of 13,000; 3,800-bbl. alkylation unit; 1,350-bbl. isomerization unit; and 500-bbl. asphalt facilities.

STANDARD OIL CO. (IND.), Casper, Wyo., will build a 37,000-bbl. crude distillation unit, with completion September 1961. This will permit retirement of obsolete crude stills, thermal cracking unit, coke stills, and some tankage.

At Whiting, Ind., the company will replace a 5,000-bbl. unit with a new 11,400-bbl. sulfuric alkylation unit in 1961. Bechtel Corp., San Francisco, has contract. Also, a waste-heat recovery plant will be completed spring 1961.

STANDARD OIL CO. OF OHIO, Lima, is scheduled to complete a new $1,500,000 carbon monoxide boiler in December 1960.

At Toledo, Standard of Ohio has been granted the first license to use California Research Corp.'s new Isocracking process. A 7,500-bbl. unit will be built to convert straightrun and cracked gas oils to gasoline.

SUN OIL CO., Toledo, Ohio, will complete a propane deasphalter in spring 1961. Contractor is Foster Wheeler Corp., New York. The 10,500-bbl. unit will increase cat feed stock and reduce residual-fuel production.

SUNSHINE STATE REFINERIES, LTD., plans to build a 25,000-bbl. refinery in the Tampa, Fla., area, but date has not yet been determined.

TIDEWATER OIL CO., Avon, Calif., has been granted second license to use California Research Corp.'s new Isocracking process. Capacity will be 20,000 bbl. per day. (First license was granted to Standard of Ohio.)

UNION OIL CO. OF CALIFORNIA, Wilmington, Calif., was to complete a 15,000-bbl. Sinclair-Baker cat reforming unit, plus Unifining capacity of 37,000 bbl. daily in fourth quarter 1960. A 5,000-bbl. Unifining unit was scheduled for completion earlier this year.

North of Seattle, Wash., Union Oil has a 2,240-acre tract for possible refinery site.

Field-Processing Construction

CABOT CARBON CO. was scheduled to complete remodeling of its Estes plant in Ward County, Texas, mid-December 1960. Capacity will be 25 M.M.c.f. daily, with liquid recovery of 37,500 gal. daily.

CONTINENTAL OIL CO. is boosting capacity from 100 to 150 M.M.c.f. daily at Lake Charles, La. Daily liquids production will range from 93,000 to 158,000 gal. Hudson Engineering Corp., Houston, has contract, with completion scheduled January 1961.

EL PASO NATURAL GAS CO. will complete a new plant in Brown-Bassett field, Terrell County, Texas, in December 1960. The new treating facility will use the Fluor Corp., Ltd., solvent CO_2 removal process and will produce 100 M.M.c.f. of residue gas daily. Natural gas from this field contains up to 53% CO_2. This will be the first gas-treating facility to use the process.

HARMATTAN area of Alberta is the site for two new plants. One at Harmattan Ekton field would have capacity of 110 M.M.c.f. daily and another at Harmattan East field, 100 M.M.c.f. daily.

HOME OIL CO., plans to double capacity

of the Carstairs Operators' Committee plant 7 miles southwest of Carstairs, Alta. Present capacity is 75 M.M.c.f. daily.

HUDSON ENGINEERING CO. will build and operate a 150-M.M.c.f. per day plant near Port Arthur, Tex., with completion spring 1961. The plant is designed for high ethane recovery.

JEFFERSON LAKE PETROCHEMICALS OF CANADA, LTD., and others will produce 100 M.M.c.f. per day of pipeline specification gas at a new plant near the East Calgary producing area. Capacity will include 860 tons of sulfur and 90,000 gal. of liquids. Contractor is Ralph M. Parsons Co. of Canada, Ltd., Toronto. Estimated cost will be $9,240,000.

At Coleman, Alta., Jefferson Lake Petrochemicals plans to complete a $20-million plant to serve Savanna Creek field in 1961. Output will include 130 M.M.c.f. per day of residue gas and 550 long tons per day of sulfur.

MOBIL OIL OF CANADA and other operators may build a 30-M.M.c.f. per day plant in the Wimborne area of Alberta. Daily production would include 4,200 gal. of stabilized gasoline and 140 long tons of sulfur.

NGL CORP. will have capacity of 20,000 bbl. per day at a plant on the Sabine River, south of Orange, Tex. Plant will process natural-gas condensate, distillate, and natural gasoline.

NORTHERN GAS PRODUCTS CO., subsidiary of Northern Natural Gas Co., will build a giant 900-M.M.c.f. per day plant at Bushton, Kans., at a cost of more than $9 million. It will extract propane, butane, isobutane, ethane, and some natural gas. Contractor is Fluor Corp., Ltd., Los Angeles.

ODESSA NATURAL GASOLINE CO. and **WARREN PETROLEUM CORP.,** are building a plant in the Azalea Strawn and Devonian gas-distillate area, Midland County, Texas. Maximum processing capacity will be 20 M.M.c.f. per day. Residue gas will move to petrochemical plants in Odessa.

OIL-CHEM CORP. of Dallas, will have initial capacity of 20 M.M.c.f. per day at a new plant at McGregor, N. D. Design capacity will be 30 M.M.c.f. Completion is scheduled spring 1961.

PAN AMERICAN PETROLEUM CORP. will have intake capacity of 177 M.M.c.f. per day at Windfall field, Alberta, 25 miles west of Whitecourt. Recovery will be 110 M.M.c.f. of residue gas, 567,000 gal. of 13-lb. stabilized condensate, 147,000 gal. of LPG, and 620 long tons of sulfur per day.

PHILLIPS PETROLEUM CO. has announced plans to build a 25-M.M.c.f. per day plant 20 miles north of Stephenville in Erath County, Texas. Gas will come from X-Ray field and the Rising Star area. Production will include 50,000 gal. of liquids per day. Completion is scheduled March 1, 1961.

Phillips and other companies will have capacity of 45 M.M.c.f. per day at the new Vermillion plant 5 miles southeast of Abbeville, La. Completion scheduled December 1960. Products will include propane, butane, LPG-mix, and natural gas.

RUNNELS GAS PRODUCTS CORP. will complete expansion of its Eunice, La., plant in January 1961. Capacity is being expanded from 450 M.M.c.f. to 800 M.M.c.f. per day. Contractor is Fluor Corp., Ltd., Los Angeles.

SHELL OIL CO. is adding new liquid-recovery facilities at the Provident City plant in Lavaca County, Texas. Additions will raise production of propane from 21,000 to 33,000 gal. daily. Natural-gasoline production will be increased from 50,000 to 55,000 gal. daily. Gasoline Plant Construction Corp., Houston, has contract, with completion first quarter 1961.

Shell's field-processing construction program also includes a 75 to 80-M.M.c.f. per day plant in the Southwest Pass area of Louisiana's Gulf of Mexico. The plant will sit on three concrete platforms on marshland and will treat casinghead from Shell's Block 24 and 27 fields.

SHELL OIL CO. OF CANADA will build a $20-million gas processing and sulfur-recovery plant in the Pincher Creek district of Alberta, designed to initially deliver about 100 M.M.c.f. per day of residue gas. Production will include 1,000 tons of sulfur and 147,000 gal. of liquids daily. Completion expected by the end of 1961.

SKELLY OIL CO. is building a new plant 5 miles north of Minneola, Clark County, Kansas, with capacity of 11 M.M.c.f. per day. Salable products will amount to about 15,000 gal. per day.

STANDARD OIL CO. OF CALIFORNIA will extract 21,000 gal. of liquids daily at a new plant in Red Wash field, Uintah County, Utah. Residue gas will move into El Paso Natural Gas Co.'s system.

TENNESSEE OIL REFINING CO. will complete a 55-M.M.c.f. per day plant at Palacios, Tex., in December 1960. Production will be about 58,000 gal. of liquids daily.

TEXAS GULF PRODUCING CO. is adding condensate fractionation at its Headlee plant in Ector County, Texas, with completion January 1, 1961. Capacity will be 40 M.M.c.f. daily and liquid recovery will be 80,000 gal. daily.

Petrochemical-Plant Construction

ALLIED CHEMICAL CORP., Baton Rouge, La., is building facilities with initial capacity of 20,000,000 lb. per year of polyethers. Completion June 1961.

At Hopewell, Va., Allied is adding 40 to 50,000,000 lb. per year capacity for caprolactam. Completion summer 1961.

Near Los Angeles, the company plans a phthalic anhydride plant, with completion in about a year.

At Orange, Tex., construction is under way to hike output of low-molecular weight polyethylene 50%.

At South Point, Ohio, methanol capacity is being increased 50% and formaldehyde capacity 35%. Completion early 1961.

AMERICAN RUBBER & CHEMICAL CO. plans facilities with initial capacity of 30,000 long tons per year of polyisoprene and polybutadiene.

AMOCO CHEMICALS CORP., Joliet, Ill., will increase capacity of dimethyl terephthalate by 50%, with completion summer 1961.

ASHLAND OIL & REFINING CO. is building facilities at Catlettsburg, Ky., for 71,500 to 119,000 bbl. per year of benzene, and 75,000,000 lb. per year of naphthalene. Completion February 1961.

AVISUN CORP. will build a 100,000,000-lb. per year polypropiene resin plant at New Castle, Del.

BRITISH AMERICAN OIL CO., LTD., Montreal, Que., will complete new Udex unit spring 1961 for production of benzene, with provision for production of toluene and xylenes.

BROCKVILLE CHEMICALS, LTD., plans to complete new petrochemical plant at Maitland, Ont., by spring 1961 for production of synthetic ammonia, hydrogen, nitrogen solutions, ammonium nitrate, and others.

CALIFORNIA CHEMICAL CO., ORONITE DIVISION (formerly California-Spray Chemical Corp.) will build a $17-million chemical complex at the Standard of California Richmond refinery for 41,000,000 lb. per year of paraxylene and 100,000,000 lb. of orthoxylene. Completion late 1961 or early 1962.

Oronite Division also will double polybutene facilities at Richmond, with completion in 1961.

CALIFORNIA CHEMICAL CO., ORTHO DIVISION (formerly California-Spray Chemical Corp.) is building a $22-million plant at Fort Madison, Iowa, for production of 150 tons per day of ammonium nitrate, 300 tons of anhydrous ammonia, and 600 tons of complex fertilizers. Completion fall 1961.

CELANESE CHEMICAL CO. has purchased a 1,000-acre site near Bay City, Tex., for a multimillion-dollar plant.

At Bishop, Tex., Celanese is building a 1, 3-butylene glycol plant with capacity of 25,000,000 lb. per year.

At Houston, Celanese is expanding low-pressure polyolefins capacity from 40,000,000 to 50,000,000 lb. per year.

CITIES SERVICE REFINING CORP. is building a 120,000,000-lb. per year orthoxylene plant at Lake Charles, La.

COLUMBIAN CARBON (CANADA), LTD., is building facilities at Toronto to produce 40,000,000 lb. per year of oil furnace blacks. Completion expected 1961.

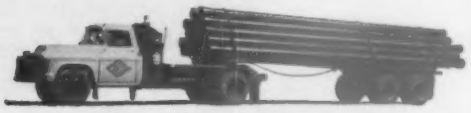
CONTINENTAL CARBON CO. will build a $4-million carbon black plant at Bakersfield, Calif. Capacity will be 30,000,000 lb. per year of four different carbon blacks. Completion early summer 1961.

Congrats and $25 to R. STROHMEYER, J. M. Huber Corp., Borger, Texas

When it comes to blowing our own horn . . . We believe it is done best by delivering pipe of quality, stamina and dependability. Lone Star, the oil country's own steel mill . . . does just that on a round-the-clock basis.

The Lone Star plant embodies the most advanced techniques in making casing, tubing, and line pipe to exacting API specifications.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.



© 1956 Lone Star Steel Company

Lone Star STEEL COMPANY

EXECUTIVE—SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
912 Republic National Bank Building, Dallas, Texas
Houston, Texas | Midland, Texas | Tulsa, Oklahoma

JOURNAL PLANT SURVEY

CONTINENTAL OIL CO. will complete new facilities at Lake Charles, La., to produce 50,000 tons per year of straight-chain primary alcohols from ethylene in 1961.

COPOLYMER RUBBER & CHEMICAL CORP., Baton Rouge, La., is expanding gross rubber capacity to 127,000 long tons per year, with completion early 1961. Butadiene capacity will be increased to 55,000 short tons per year by mid-1961.

DIAMOND ALKALI CO., Belle, W. Va., will increase capacity of chlorinated methanes by March 1961.

At Deer Park, Pasadena, Tex., vinyl chloride polymer will be produced at new facilities February 1961. Also, capacity for 40,000,000 lb. per year of acetylene from methane and oxygen will be completed January 1962.

DOW BADISCHE CHEMICAL CO., Freeport, Tex., will complete facilities for n-butanol and isobutanol early 1961. Facilities for 40,000,000 lb. per year of caprolactam scheduled for completion January 1962.

DOW CHEMICAL CO., Allyn's Point, Conn., will have new facilities to produce latex from styrene and butadiene first quarter 1961.

At Freeport, Tex., polyglycol plant is being expanded. Completion early 1961.

At Kalama, Wash., new plant for production of 36,000,000 lb. per year of phenol from toluene will be completed third quarter 1961.

At Torrence, Calif., polypropylene facilities will be added in 1961.

At Williamsburg, Va., Dow will complete facilities for 12,000,000 lb. per year of nylon 6 late 1961.

DOW CHEMICAL OF CANADA, LTD., Fort Saskatchewan, Alta., will complete facilities for glycols and amines late 1961.

At Vancouver, B. C., facilities for 24,000,000 lb. per year of phenol will be completed mid-1961.

DU PONT DE NEMOURS & CO., E. I., Beaumont, Tex., will complete new facilities for acrylonitrile in 1961 or early 1962. Capacity will be about 50,000,000 lb. per year.

At Victoria, Tex., Du Pont will complete new facilities for production of high-pressure polyethylene by late 1961.

DX SUNRAY OIL CO., Tulsa, completed a Udex unit late this year with capacity including 600 bbl. per day of benzene. This will be doubled by mid-1961 when new Hydeal unit is completed.

EL PASO NATURAL GAS CO. and **REXALL DRUG & CHEMICAL CO.** are building new facilities at Odessa, Tex., for 150,000,000 lb. per year of ethylene and 120,000,000 lb. of high-pressure polyethylene, with completion January 1962. Facilities will also be built for production of propylene, linear polyethylene and polypropylene.

ETHYL CORP., Pasadena, Tex., will complete new facilities to produce vinyl chloride monomer early 1961.

FIRESTONE TIRE & RUBBER CO., Akron, Ohio, is increasing capacity of SBR copolymer.

At Orange, Tex., Firestone will complete new polymer facilities in January 1961, increasing the company's capacity for synthetic rubber by nearly 12%. Capacity will be 30,000 tons per year of either polybutadiene or polyisoprene, with initial production of polybutadiene.

FOSTER GRANT CO., INC., will build a 12,000,000-lb. per year high-pressure polyethylene plant at Beaumont, Tex. Completion scheduled mid-1961.

GOODRICH-GULF CHEMICALS, INC., will build a plant to make polyisoprene and/or polybutadiene either at Institute, W. Va., or in Orange County, Texas. Capacity 25,000 tons per year, with completion late 1961.

At Port Neches, Tex., facilities for 13,000,000 lb. per year of polyethylene will be completed early 1961.

GOODYEAR TIRE & RUBBER CO. will complete new facilities for polyisoprene and polybutadiene at Beaumont, Tex., spring 1961.

GRACE & CO., W. R., will increase ammonia capacity at Memphis, Tenn., by 60,000 tons per year. Completion first quarter 1961.

GULF OIL CORP. will complete oxo alcohols plant at Philadelphia early 1961, with capacity of 35,000,000 to 40,000,000 lb. per year. Additional facilities for oxo derivaties to follow.

HERCULES POWDER CO., Hercules, Calif., is building facilities for 50,000 lb. per year of formaldehyde, 8,000,000 gal. per year of methanol, and 11,000 tons per year of urea-formaldehyde compositions.

At Lake Charles, La., Hercules will have new capacity for 100,000,000 lb. per year of polypropylene, with half of this ready early 1961.

HEYDEN NEWPORT CHEMICAL CORP., Fords, N. J., was to complete plant for 24,000,000 lb. per year of maleic anhydride early 1961.

HOOKER CHEMICAL CORP. will complete new plant for phenol at South Shore, Ky., end of 1961.

HOUSTON CHEMICAL CORP. will build new facilities for tetraethyl and tetramethyl lead, and ethylene oxide and derivates at Beaumont, Tex. Completion mid-1962.

HUMBLE OIL & REFINING CO., ESSO STANDARD DIVISION, Baton Rouge, La., is adding 18,000 long tons per year butyl rubber capacity, with completion second quarter 1961.

HUMBLE OIL & REFINING CO., HUMBLE DIVISION, Baytown, Tex., is expanding butyl rubber capacity by 19,500 long tons per year, with completion second quarter 1961.

IMPERIAL OIL LTD., Sarnia, Ont., will complete a benzene plant with annual capacity of 30,000,000 gal. per year fall 1961.

JEFFERSON LAKE PETROCHEMICALS OF CANADA, LTD. will have capacity of more than 860 long tons of sulfur per day at new plants in East Calgary and Savanna Creek fields, Alberta.

GEM
OF THE
OIL AND GAS
INDUSTRY

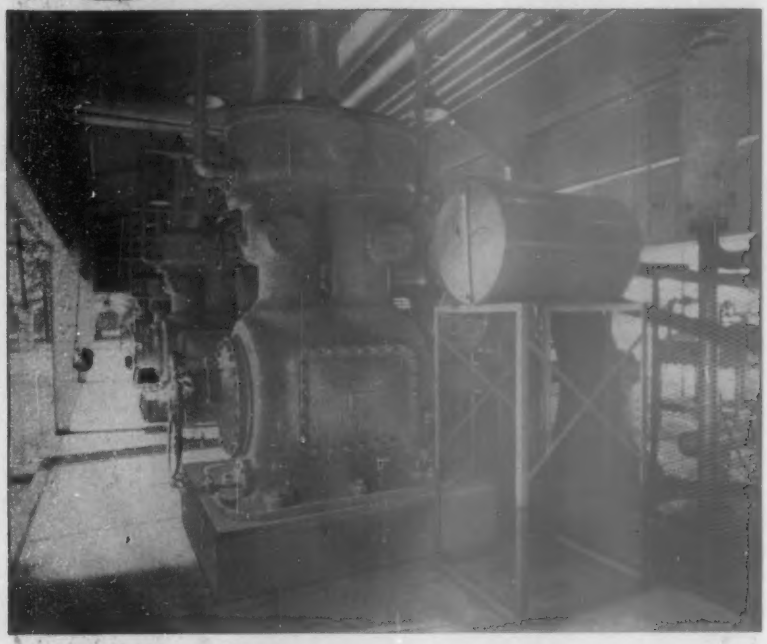
Lone Star line pipe is the top "fashion" in the oil and gas country. Made to exacting API specifications . . Lone Star pipe is an outstanding example of fine craftsmanship in steel.

Field-proved year after year, fully normalized and with bendability that easily adapts to rugged terrain . . Lone Star pipe is called the gem of the oil and gas industry by pipeliners everywhere.

Lone Star STEEL COMPANY

EXECUTIVE—SALES OFFICES
W. Mockingbird Lane at Ropar • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
912 Republic National Bank Building, Dallas, Texas
Houston, Texas | Midland, Texas | Tulsa, Oklahoma

364 TONS OF FRICK REFRIGERATION . . .



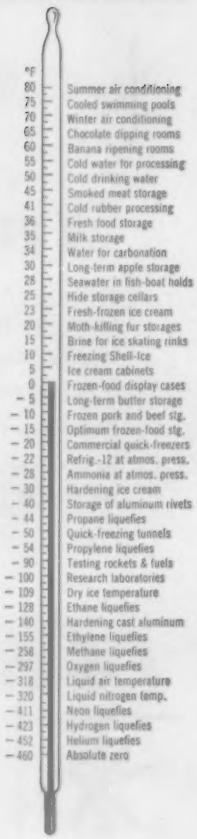
PRODUCE PROFITABLE YIELD OF PROPANE, BUTANE AND NATURAL GASOLINE

● The location: about 30 miles north of Lake Charles, Louisiana. The plant: the Upper Bearhead Creek Sand Unit, operated by H. L. Hunt. The refrigeration equipment: designed and manufactured by the Frick Company.

This is only one of several dozen natural gasoline plants equipped by Frick. Here, as in others, rich casinghead gas is compressed to 950 Psig. and then dehydrated with the temperature being lowered to about 0° F. in a gas chiller that uses ammonia as the refrigerant. This way, hydrocarbon liquids are condensed and then fractionated into Propane, Butane and natural gasoline.

If you have a refrigeration problem of *any* type, Frick has the answer. A Frick engineer will call and discuss it with you at your convenience. No obligation at all. Write:

FRICK COMPANY
Waynesboro, Pennsylvania


°F
80 Summer air conditioning
75 Cooled swimming pools
70 Winter air conditioning
65 Chocolate dipping rooms
60 Banana ripening rooms
55 Cold water for processing
50 Cold drinking water
45 Smoked meat storage
41 Cold rubber processing
36 Fresh food storage
35 Milk storage
34 Water for carbonation
30 Long-term apple storage
28 Seawater in fish-boat holds
25 Hide storage cellars
23 Fresh-frozen ice cream
20 Moth-kifling fur storages
15 Brine for ice skating rinks
10 Freezing Shell-Ice
5 Ice cream cabinets
0 Frozen-food display cases
− 5 Long-term butter storage
− 10 Frozen pork and beef stg.
− 15 Optimum frozen-food stg.
− 20 Commercial quick-freezers
− 22 Refrig.-12 at atmos. press.
− 28 Ammonia at atmos. press.
− 30 Hardening ice cream
− 40 Storage of aluminum rivets
− 44 Propane liquefies
− 50 Quick-freezing tunnels
− 54 Propylene liquefies
− 90 Testing rockets & fuels
− 100 Research laboratories
− 109 Dry ice temperature
− 128 Ethane liquefies
− 140 Hardening cast aluminum
− 155 Ethylene liquefies
− 258 Methane liquefies
− 297 Oxygen liquefies
− 318 Liquid air temperature
− 320 Liquid nitrogen temp.
− 411 Neon liquefies
− 423 Hydrogen liquefies
− 452 Helium liquefies
− 460 Absolute zero

JOURNAL PLANT SURVEY

MOBIL CHEMICAL CO., Beaumont, Tex., will complete these facilities first quarter 1961: 380,000,000 lb. per year of ethylene, 100,000,000 lb. of propylene, and 20,000,000 lb. of butadiene. Scheduled for completion early 1962 are facilities for 30,000,000 gal. per year of benzene. Toluene also will be produced.

MONOCHEM, INC., will build a new plant somewhere on the Gulf Coast for 80,000,000 lb. of acetylene and 150,000,000 lb. of vinyl chloride monomer yearly, with completion 1962. Parent companies, Borden Co. and U. S. Rubber Co. each will then erect other plants to use this material.

MONSANTO CHEMICAL CO. will build a phthalic anhydride and phthalate ester plasticizer plant in Gloucester County, New Jersey. Completion scheduled early 1962.

In Texas City, Monsanto will complete a new phenol plant with capacity of 50 to 75,000,000 lb. per year spring 1962.

NAUGATUCK CHEMICAL, Division of U. S. Rubber Co., Baton Rouge, La., will build a pilot plant for synthetic stereo-regular rubber. Initial production will concentrate on ethylene-propylene copolymer and synthetic balata. Completion fall 1961.

NOVAMONT CORP., Neal, W. Va., is scheduled to complete a $10-million, 25,000,000-lb. per year plant for polypropylene and other polyolefins July 1, 1961.

PETRO-TEX CHEMICAL CORP., Houston, will complete facilities for maleic anhydride by mid-1961. Capacity will be 30,000,000 lb. per year.

PHILLIPS CHEMICAL CO., Pasadena, Tex., is increasing capacity of high-density polyethylene about one-third to total of 100,000,000 lb. per year, with completion 1961.

At Sweeny, Tex., ethylene capacity is being expanded to 510,000,000 lb. per year.

PHILLIPS PETROLEUM CO., Sweeny, Tex., will build a plant for 22,000,000 gal. per year of high-purity benzene. Completion by mid-1961.

PITTSBURGH CHEMICAL CO. is adding facilities for 20,000,000 lb. per year of maleic anhydride at Neville Island (Pittsburgh). Completion first quarter 1961.

PLYMOUTH OIL CO., Republic Division, Texas City, will produce 15,000,000 gal. per year of benzene when new Hydeal unit is completed May 1961.

POLYMER CORP., LTD., will build a cis-polybutadiene synthetic-rubber plant at Sarnia, Ont., with capacity of 20,000 tons per year.

RICHARDSON CARBON CO., SID, will build a 50,000,000-lb. per year furnace carbon black plant adjacent to the Cosden refinery at Big Spring, Tex.

RICHFIELD OIL CORP. will complete new facilities at Watson, Calif. for high-purity propylene in 1961.

ROHM & HAAS CO. is remodeling the Louisville, Ky., butadiene plant which

formerly belonged to the government, for production of methyl methacrylate monomer, acrylic molding powder, and ammonium sulfate. Completion mid-1961.

SHELL CHEMICAL CO. will have capacity of 80,000,000 lb. per year of polyisoprene at new plant near Marietta, Ohio. Completion late 1961.

At Woodbury, N. J., Shell Chemical will build a polypropylene plant with initial capacity of 80,000,000 lb. per year. Completion in 1962.

SIGNAL OIL & GAS CO., Houston, will complete a Hydeal plant to convert an aromatic toluene feed to benzene January 1961. Capacity will be 1,000 bbl. per day of benzene.

SINCLAIR-KOPPERS CHEMICAL CO. is building facilities for 70,000,000 lb. per year of styrene monomer from petroleum fractions at Houston. Completion mid-1961.

SINCLAIR PETROCHEMICALS, INC., Houston, is building facilities to produce 70,000,000 lb. per year of orthoxylene. Completion second quarter 1961.

SOGEMINES, LTD., is building new facilities at Maitland, Ont., to produce hydrogen, nitric acid, ammonium nitrate, nitrogen solutions, and other ammonia derivatives from natural gas.

SOLAR NITROGEN CHEMICALS CO. (Atlas Powder and Standard of Ohio), will produce 300 tons per day of anhydrous ammonia and urea at a plant to be completed at Joplin, Mo., in 1961.

SOUTHERN NITROGEN CO., INC., Savanna, Ga., is boosting urea facilities from 10,000 to 16,000 tons per year, with completion January 1, 1961. Scheduled for completion October 1, 1961, is a project to increase nitric acid facilities from 100,000 to 130,000 tons per year.

ST. PAUL AMMONIA PRODUCTS, INC., Pine Bend, South St. Paul, Minn., is expanding ammonia capacity to more than 300 tons per day, with completion spring 1961.

STANDARD OIL CO. OF CALIFORNIA will have new facilities for 20,000,000 lb. per year of maleic anhydride at Richmond, Calif.

SUN OIL CO. will complete facilities for 100,000,000 lb. per year of naphthalene at Toledo, Ohio, late 1961.

SUNOLIN CHEMICAL CO., North Claymont, Del., will complete these facilities late 1961: 225,000,000 lb. per year of ethylene and 55,000,000 lb. per year of ethylene oxide.

SUNTIDE REFINING CO., Corpus Christi, Tex., will increase benzene capacity to 1,250 bbl. per day when project is completed January 1961. New facilities to produce 60,000,000 lb. per year of styrene will be completed early 1962.

TENNESSEE OIL REFINING CO. will complete plant for 2,000 bbl. per day of benzene, toluene, and xylenes at Chalmette, La., spring 1961.

TEXACO CANADA LTD. reportedly will build plant to produce 1,500 bbl. per day of benzene, with completion early 1961.

TEXAS EASTMAN CO., Longview, Tex., is adding 20,000,000 lb. polypropylene capacity per year, with completion 1961.

TIDEWATER OIL CO. and **COLLIER CARBON & CHEMICAL CORP.** are building a new naphthalene plant at Delaware City, with capacity of 100,000,000 lb. per year, double the original plans.

At Wilmington, Calif., the two companies have proposed a 50,000,000-lb. per year naphthalene plant, with possible completion late 1961.

UNION CARBIDE CANADA, LTD., is doubling combined capacity for ethylene oxide, polyglycols, glycol ethers, and ethanolamines at Montreal East. Completion first quarter 1961.

UNION CARBIDE CORP. is converting the old Brownsville, Tex., Amoco synthetic fuels plant to petrochemicals, with completion early 1961. Products to include acetic acid, acetic anhydride, and methyl ethyl ketone.

UNION CARBIDE CARIBE, INC., will have capacity of 110,000,000 lb. per year of polyethylene at Ponce, Puerto Rico. Completion second half 1962.

UNION CARBIDE CHEMICALS CO., is increasing low-density polyethylene capacity by 170,000,000 lb. per year at the Seadrift and Texas City plants, with completion in 1961.

UNITED CARBON CO., Baytown, Tex., is expanding SBR capacity from 145,000,000 to 200,000,000 lb. per year.

The company will build a $5-million carbon black plant with 64,000,000 lb. annual capacity in southern California. Completion late 1961.

U. S. PHOSPHORIC PRODUCTS will build a 350-ton per day ammonia plant at Tampa, Fla., using natural gas. Completion late 1961.

WITCO CHEMICAL CO. will build a 30,000,000-lb. per year phthalic anhydride plant somewhere on the East Coast, with completion late 1961.

WITFIELD CHEMICAL CORP. is building a $1,750,000 plant to produce dodecylbenzene from benzene and propylene tetramer at Los Angeles, with completion early 1961.

Drop noted in metal contamination of cracking catalysts

ALL metal contaminants have decreased, according to the current quarterly survey on cat cracking catalysts by Davison Chemical Co. Results are from 71 of the 83 fluid units participating in the catalyst-testing program. These units represent about 50% of the fluid units in the United States and Canada.

In particular, vanadium, nickel, and sodium levels are substantially lower than values reported in the more recent surveys. And all metals except sodium show a decrease in the range of contamination.

Remaining tests in the current survey show little change in catalyst activity level.

QUALITY TRENDS IN EQUILIBRIUM FLUID CRACKING CATALYSTS

Period—	Present quarter May-July 1960		Previous quarter February-April 1960		Year ago May-July 1959	
	Mean	Range*	Mean	Range*	Mean	Range*
Activity, D + L	29.2	23.8-34.6	29.3	23.8-34.7	28.8	23.7-33.9
Surface area, $M^2/g.$	119	68-170	119	64-174	119	71-166
Pore volume, cc./g.	0.38	0.25-0.51	0.38	0.23-0.54	...	.....
Apparent bulk density, g./cc.	0.73	0.62-0.84	0.72	0.60-0.84	...	.....
Metal contamination:						
Vanadium, p.p.m.	162	35-755	196	45-852	203	46-887
Nickel, p.p.m.	67	15-314	85	15-489	78	11-547
Copper, p.p.m.	3	0.4-31	4	0.5-32	4	0.4-40
Sodium, p.p.m.	458	54-3,856	549	89-3,487	579	91-3,701
Iron, wt. %	0.36	0.12-1.10	0.39	0.12-1.31	0.36	0.11-1.22

*Ninety-five per cent of fluid units tested fall within these limits.

HALF a MAN

is not enough!

human interests must balance technical efficiency

Consistent improvement has been made over the years in the quality and service of Western Heat Exchangers, as well as in providing more effective solutions to the heat transfer problems of our customers by recognizing the need for keener insight into the personalities and problems of the **people** with whom we deal — our suppliers, customers, employees and associates.

Every advance we have made in design, mechanics, metallurgy and fabrication is the product of **engineers** — not engineering — **creative individuals** whose technical proficiency is balanced by their understanding of the individual problems of the people we serve and with whom we work.

Increased efficiency, longer life, less maintenance, lower costs — these are the benefits that accrue to Western customers as a result of this philosophy of business. **We could do no less for you, given the opportunity.**

WESTERN'S STAKE IN YOUR FUTURE

. . . is in the hands of men — *whole* men — whose professional acumen is matched by an insight to the human relationships in engineering. This vital need is more completely exposed in the latest of Western's "engineer-advancement" messages, the first few lines of which are shown at right. A complete pamphlet on the subject is available to you, singly or in quantity, upon request.

One of a series appearing in OIL & GAS JOURNAL, CHEMICAL ENGINEERING, PETROLEUM REFINER, REFINING ENGINEER, CHEMICAL ENGINEERING PROGRESS.

Facts-of-Life for successful engineers must include attitude, self-appraisal, vision, understanding, respect, relaxation and "happiness"

Achieving "success" and/or "happiness" in your professional and personal future won't just "happen," regardless of how diligently you apply yourself to your daily tasks, unless your efforts are coordinated along specific paths of endeavor. Your life as an engineer must be counterbalanced by your life as an individual — because "engineers ARE human," despite comment to the contrary.

serving the growth of the process industry

WESTERN

HEAT EXCHANGERS

WESTERN SUPPLY COMPANY

P. O. Box 1888 – Tulsa, Oklahoma

The
FOREMAN'S PAGE

Quiz on refinery chemistry

Please place a check (✓) mark opposite the right answer.

1. Hydrocarbons are:
.... (a) Organic compounds.
.... (b) Inorganic compounds.
.... (c) Elements.

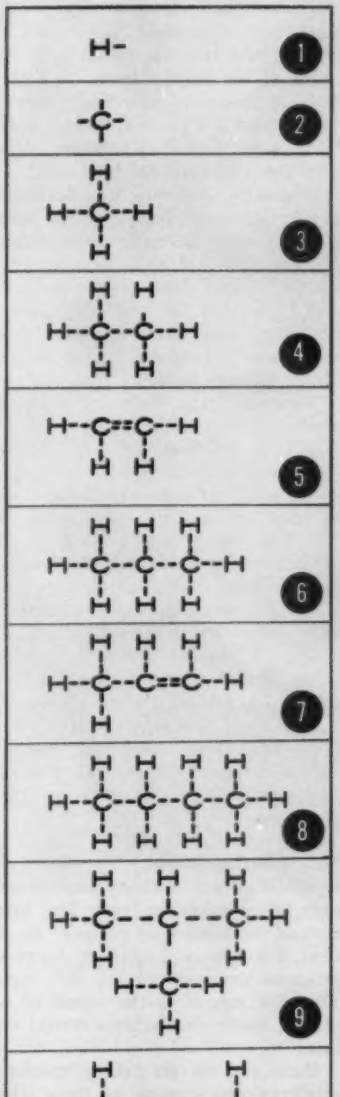
2. In general the more carbon atoms that a molecule of a hydrocarbon contains:
.... (a) The lower the boiling point of the hydrocarbon.
.... (b) The higher the boiling point of the hydrocarbon.
.... (c) Makes no difference in the boiling point.

3. Paraffin-type hydrocarbons are not very chemically reactive because the carbon atoms are:
.... (a) Unsaturated.
.... (b) Unstable.
.... (c) Saturated with H atoms.

4. Give the name of one olefin found in a refinery stream:

.....

5. Which one of these hydrocarbons would make a good feed to a polymerization unit?
.... (a) Isobutane.
.... (b) Propylene.
.... (c) Propane.



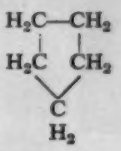
6. Indicate formula number opposite correct name.
.... (a) Isobutane.
.... (b) Pentane.
.... (c) Butylene.
.... (d) Propane.
.... (e) Propylene.
.... (f) Hydrogen
.... (g) Carbon
.... (h) Ethane
.... (i) Isobutylene
.... (j) Butadiene
.... (k) Ethylene
.... (l) Methane
.... (m) Butane

7. The naphtha produced at the catalytic cracker differs in one way from the naphtha cut at a pipe still because it contains:
.... (a) Lower per cent branched-chain hydrocarbons.
.... (b) Higher per cent of aromatics.
.... (c) Higher per cent of paraffinic hydrocarbons.

8. What type of chemical reaction takes place when water changes to steam?
.... (a) Vaporization.
.... (b) None.
.... (c) Latent heat.

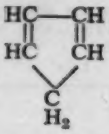
Correction . . .

In Part 4 of the series on refinery chemistry (OGJ, Oct. 3, p. 114) see the third column. The symbol for cyclopentane should be:

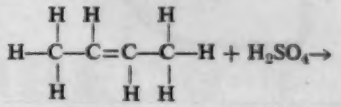
or 

Cyclopentane

The symbol for cyclopentadiene should be:

 Cyclopentadiene

And, in Part 6 (OGJ, Oct. 17, p. 123) we goofed again. In the first column the symbol for butylene should be:



Butylene Sulfuric acid

QUIZ ANSWERS

1. (a) Organic compounds.
2. (b) The higher the boiling point of the hydrocarbon.
3. (c) Saturated with H atoms.
4. Ethylene, propylene, butylene, amylene, hexylene, etc.
5. (b) Propylene.
6. (a) 9, isobutane; (b) not shown; (c) 10, butylene; (d) 6, propane; (e) 7, propylene; (f) 1, hydrogen (g) 2, carbon; (h) 4, ethane; (i) 11, isobutylene; (j) not shown; (k) 5, ethylene; (l) 3, methane; (m) 8, butane.
7. (a) Higher per cent of aromatics.
8. (b) None.

This material taken from process-training-program manual, Bayway, N. J., refinery of Esso Standard Division of Humble Oil & Refining Co.

BY ED McGHEE
Drilling Editor

New tubing joint combines low cost, leak tightness, and small diameter

JUST ANNOUNCED is a new collar-type joint for nonupset tubing which has almost all the advantages of upset-tubing joints. Moreover, the new nonupset joint costs the same as conventional upset API joints.

Because it is put on plain-end pipe, the new joint is much smaller in diameter than upset joints. That is:

1. The new joint for 2⅜-in. tubing regularly has an outside diameter of only 2.875 in. For special clearances, it can be turned down to 2.700 in.

2. API joints on upset 2⅜-in. tubing are regularly 3.063 in. diameter and can be turned down to no less than 2.910.

Manufacturer of the joint is National Tube Division of United States Steel Corp. National Tube calls its product the buttress-thread joint because of the thread form used. The buttress thread is now being cut on 2⅜-in. and 2⅞-in. o.d. tubing in the J-55, N-80, and P-105 grades; other sizes are scheduled for later dates.

Originally, the joint was developed as a low-cost connection for the parallel strings used in multiple completions and for tubing in wells with small-diameter casing. Now, National Tube says it believes the joint has enough advantages that many strings of buttress-thread tubing will be run in conventional single completions.

National Tube claims these additional advantages for its joints:

1. Field handling is simple; the pipe can easily be rethreaded in the field. Upset pipe, on the other hand, must be taken to a mill for reupsetting.

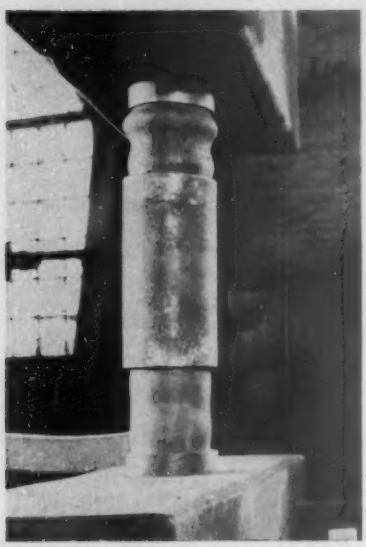
2. The tubing can be made up and broken out in the field 12 times or more without thread damage.

3. Joint strength in tension is about 98% of pipe-body strength.

4. Tin plating inside the collars helps protect against leakage at pressures up to 15,000 psi.

5. Makeup torque is low.

6. Pipe and couplings can be stabbed together on normal drop impact without thread damage or cross-threading.



PIPE BUCKLES under impact in compressive tests before threads are damaged or there is any slippage. Joint efficiency in tension is 98%.

Low makeup torque. National Tube reports that the buttress joint is gas-tight when made up only 2½ turns beyond the hand-tight position. In the field, a torque of 900 ft.-lb. normally produces the required 2½ to 3 turns. This low torque is the result of tin plating inside the buttress-thread collars.

Each end of the tubing carries a small reference mark to show when the pipe threads have been made up into the collars a proper distance.

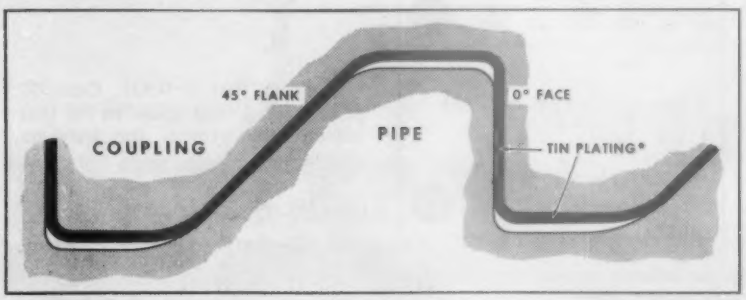
Only about 1,600 ft.-lb. of torque is required to run the end of the tubing to the center of the coupling on initial makeup. For this reason, National Tube recommends that maximum torque be limited to 1,000 lb. And, for the same reason, the company states that the new joint must not be used for drilling.

National Tube says that the easy stabbing and low makeup torque make the joint faster to use in laying surface lines than are conventional joints.

MORE THAN 1,000,000 FT. of tubing with the new buttress-thread joint has been run without difficulty.

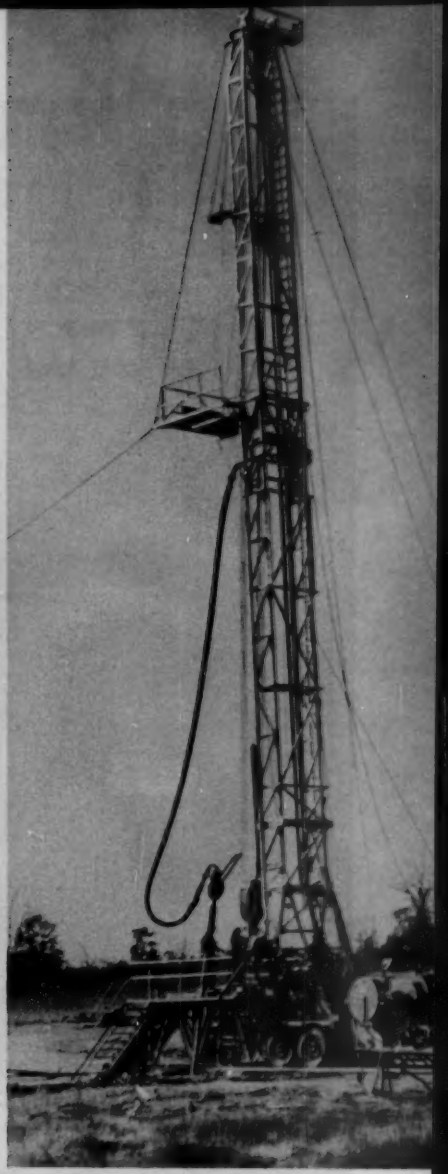
Near yield strength. In thermal-cycling tests, J-55 tubing with the buttress-thread joint was pressured to as much as 8,300 psi. which is 95% of the minimum yield pressure. There were no leaks even in joints which had been made and broken 12 times. Similarly, there was no leaking in P-105 tubing when pressured to 15,400 psi. which is 92% of minimum yield.

Compression and tension tests were also run on the new joints. Compression tests were made both by slowly applying the load and by impact loading. National Tube reports that even with the special-clearance couplings, the tubing buckled before there was any damage or slippage in the joint. Tension tests showed the buttress joint to be essentially as strong as the body of the pipe in both J-55 and N-80 grades. Average joint efficiency in tension, the company claims, is about 98%.



BUTTRESS THREAD FORM is similar to that used for past 8 years on casing. Close tolerances and tin plating inside collar make a joint that is highly leak-resistant in spite of small diameter.

RIG REPORT



FOR SERVICING AND WORKOVER

. . . In the fields of South Texas, this Ideco Drive-In Rambler is equipped with an Ideco DUAL SPEED SYSTEM which saves 30 to 50 per cent of the time usually required to pull or run tubing. On this location 185 stands were run in the hole in 45 minutes. Drive-In Ramblers equipped with the Dual Speed System are the answer to faster, more efficient, and more economical well servicing and workover operations. The Dual Speed System can be installed on most types of Ideco servicing and workover rigs.

FOR COMPLETION

. . . On a deep well in the scenic foothills of the Canadian Rockies. This Ideco DIR-604 Drive-In Rambler rig is the largest self-propelled rig ever put on location in Canada. Nearly 400 horsepower propells this highly-mobile rig to the job. The same engine powers the H-40 Hydrair Hoist on the job. The 95-ft. Kwik-Lift Mast has a gross column capacity of 300,000 pounds and a hook load capacity of 180,000 pounds. It will rack 13,340′ of tubing or 6,000′ of 4½″ drill pipe.

FOR DRILLING

. . . On locations in Northern Louisiana and Arkansas, this Ideco DIR-503 is regularly drilling 3,000 to 6,000 feet. Drive-In Ramblers are particularly suited to "slim-hole" drilling to even greater depths. These rigs can be equipped with engines ranging from 114 to nearly 400 horsepower. A wide range of Ideco Hydrair Hoists and Kwik-Lift Masts are available. Ask your Ideco representative for full details on these versatile, highly-mobile, self-propelled rigs.

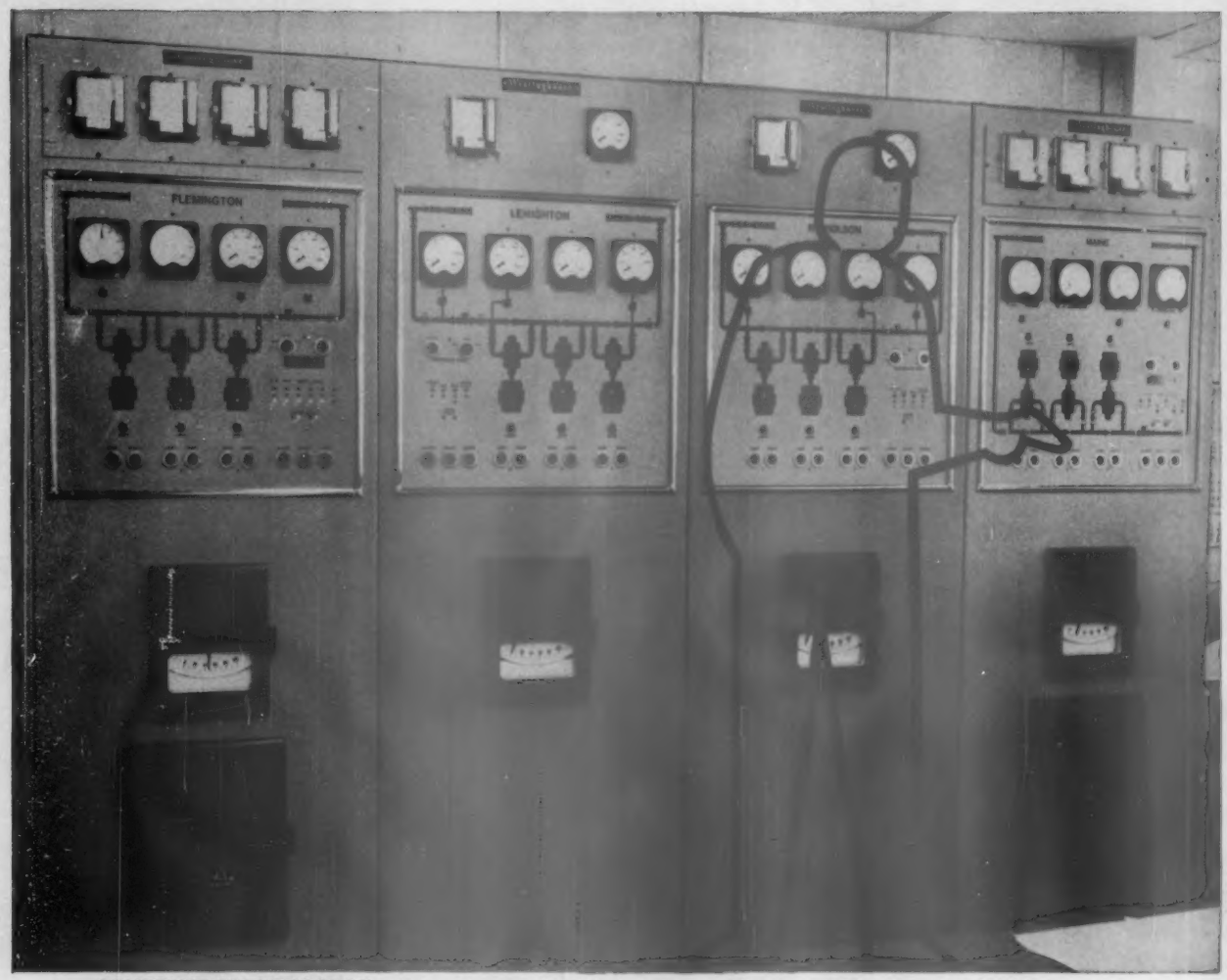
IDECO DRIVE-INS—four ways faster

faster moves—faster rig-up—faster work—faster rig-down

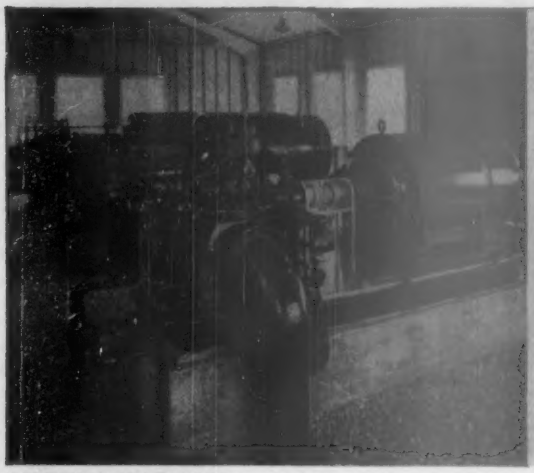
WRITE FOR BULLETIN DRB-6A

IDECO

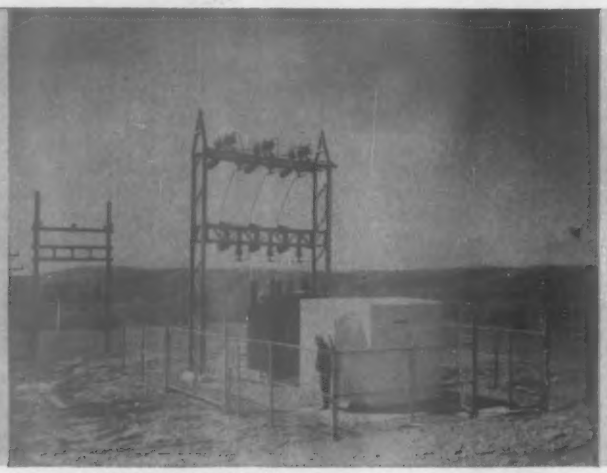
P. O. Box 1331, Dallas, Texas



CONSTANT SURVEILLANCE of operations at Buckeye's automated booster station is maintained by a Westinghouse control system. Indicator lights alert the dispatcher in Macungie, Pa., of any equipment trouble.



"NO MAJOR REPAIRS in 10 years." That's Buckeye's forecast for the huge, explosion-proof Westinghouse pump motors at the heart of Buckeye Pipe Line's new, remotely controlled booster station. Electrically powered stations like this Westinghouse-equipped installation at Maine, N.Y., are in sharp contrast to older, steam-operated stations needing 14 men around the clock.



"BEST POSSIBLE DESIGN" is Buckeye's opinion of 2000-kva Westinghouse transformer which steps incoming 34,400-volt power down to 2300 volts. Highly efficient operation was achieved after computer evaluated all possible design variables. Transformer's Insuldur® insulation system permits overloads with no reduction in service life.

WESTINGHOUSE AUTOMATES BUCKEYE PIPE LINE'S NEW 120,000-BARREL BOOSTER STATION FOR REMOTE CONTROL

A dispatcher in Macungie, Pa., can completely control operations at Buckeye Pipe Line Company's new booster station 200 miles away, at Maine, N.Y. The Westinghouse-equipped station was built to step up Buckeye's capacity from 80,000 barrels per day to 120,000 barrels per day. The installation is the newest of five booster stations along a 14-inch pipeline that delivers refined oil products for 14 oil companies located from Linden, N.J., to Buffalo, N.Y. The Buckeye booster station at Maine represents the latest advances in pipeline automation.

"The station," reports the station foreman, "is seldom attended in person . . . and then by only one man. From the power transformer, switchgear and fault detection system to the electric pump motors, Westinghouse equipment enables our Allentown dispatcher to control pumps at the station, and learn from remote recording instruments the operating conditions of any one of the three motors, as well as the emergency shutoff valves. Any emergency warning lights that flash in the station will also flash in Macungie so that the dispatcher always knows whether everything is in proper working order."

The three 2300-volt Westinghouse pump motors provide 500 hp, 600 hp and 700 hp for pumping gasoline and heating oil. Pump power is converted to 2300 volts from an incoming 34,400 volts by a 2000-kva, oil-filled, outdoor Westinghouse transformer. A smaller service transformer, rated 75 kva, supplies power for lighting and auxiliary equipment.

To aid pipeline operators in achieving more efficient, cost-saving distribution, Westinghouse offers a long-term, step-by-step plan leading to economical automatic operation. It is called *Progressive Automation*. For more facts about *Progressive Automation*—call your closest Westinghouse representative. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. *You can be sure . . . if it's Westinghouse.*

J-96157

Westinghouse

RELIABLE CIRCUIT PROTECTION for station's electrical system is provided by Westinghouse metal-clad switchgear. Maintenance is facilitated by use of horizontal drawout-type DH magnetic air circuit breaker. Switchgear can be remotely or locally operated.

ADEQUATE POWER AND PROTECTION for supervisory controls, lighting and auxiliary station equipment are supplied by Westinghouse control center. Center is composed of interchangeable, space-saving, easily installed modular units.

CHAIN DRIVE, with constant speed, provides known r.p.m. for laboratory tests. Fig. 1.

Why engine lubrication fails

This is the first of a three-part series on engine lubrication. It blames poor lubrication on faulty equipment. The second part (O&GJ, Dec. 19) will tell how pumps can be modified to effect more even distribution of oil. The third (O&GJ, Jan. 2) will outline other steps to improve lubrication.

BY O. H. MOORE
Director, Operating Research,
Tennessee Gas Pipeline Co.

LUBRICATION STUDIES of internal-combustion engines show that piston ring and cylinder wear vary with no definite pattern.

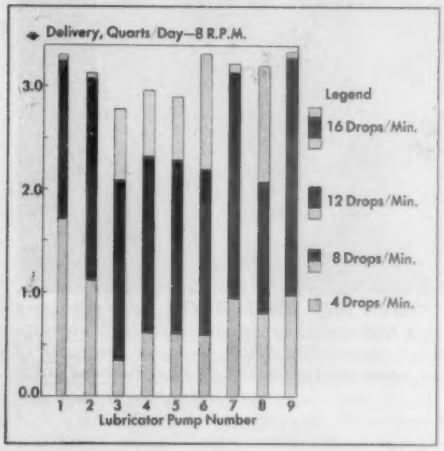
Engine manufacturers have run the gamut with respect to the number of points of feed and their location within the cylinder in an effort to insure proper cylinder lubrication. Gadget after gadget has been designed and used on the outlet of lubricator pumps to control the quantity of oil that is delivered to the cylinder.

Spot checking of existing lubrication systems can show adequate lubrication at one point and starvation lubrication at an adjacent point for the same delivery rates.

It is our opinion that conflicting conclusions and irregular patterns of wear are results of erratic oil delivery. Neither the "drops per minute" method nor turns of the adjusting screw has provided an accurate control.

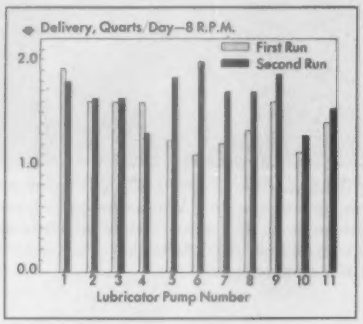
Most of our studies were confined to lubricators. The results of early tests were startling. No claim is made to having isolated the basic problem nor having come up with a positive correction. However, a trial of these

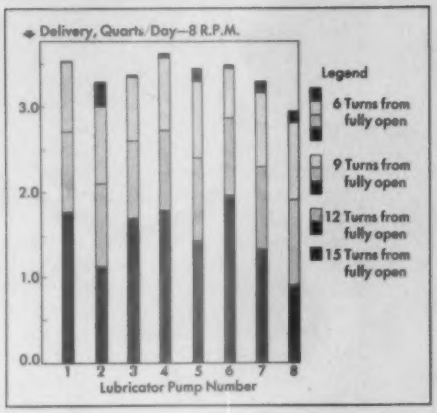
Paper presented at CNGA fall meeting, Santa Monica, Calif.



DROPS PER MINUTE variations among pumps run as high as 70%. Fig. 2.

RERUNS SHOW that only 2 of 11 pumps have same output on second test. Fig. 3.





"TURNS" METHOD gives similar increments but irregular starts. Fig. 4.

tests will almost certainly provide surprising results.

In these tests, standard lubricator reservoirs were chain-driven with a constant-speed motor (Fig. 1). This gave a known r.p.m.

The first test involved the "drop-counting" method. In it, drops of oil rising through the clear liquid in the sight glass are counted. The number of drops is set in accordance with the oil to be delivered to the point of lubrication.

All lubricators were adjusted exactly alike by the drop-counting method. Despite the uniformity of the test procedure, there was no consistency in the rates of delivery. Initial tests were made with the adjustment of the lubricators at 4, 6, and 8 r.p.m. and the delivery rate varying from 1 to 42 drops per minute. Results of one test are shown in Fig. 2.

It was found that:

1. The delivery rate per pump was very inconsistent, varying as much as 70%.

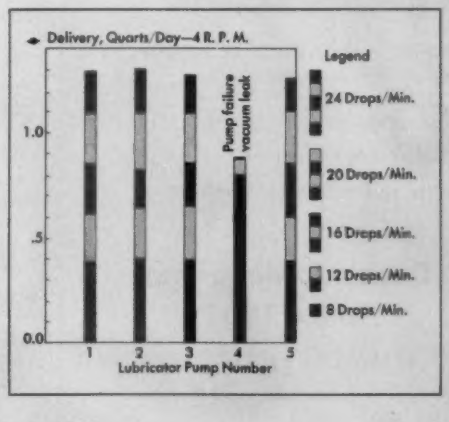
2. Equal changes in drops per minute did not result in equal changes in pump output.

3. Variations were neither consistently higher nor consistently lower than the average. In a few pumps, an increase in drops per minute actually resulted in a reduced output.

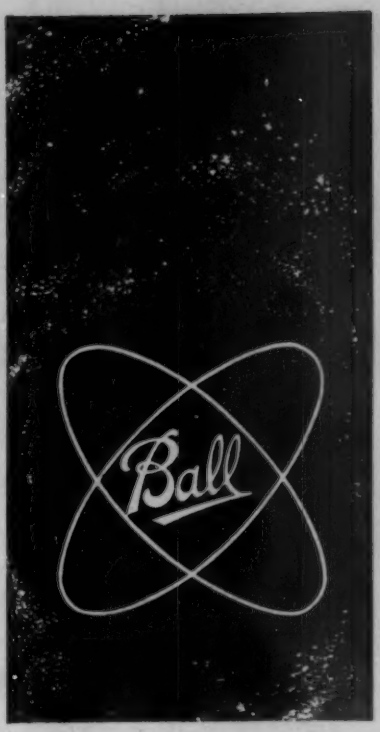
As a further check, a number of pumps were adjusted to the same drop setting, operated for a period of time and their outputs recorded. The pumps were then deliberately thrown off this setting and readjusted to the same rate. Of the 11 tested, only two approximated the same output on the rerun (Fig. 3).

It was concluded that the drop of oil moving through the sight feed is not a measured drop. Its only value is as an indication of flow and not as a control of the quantity of oil being delivered to the pump.

Another common method for adjusting the output of a lubricator is the so-called "turns" or "flats" method. Incremental changes are obtained by turning the adjusting screw a certain number of complete revolutions or flats from fully open or fully closed. Tests were made at 4 and 8 r.p.m. Typical results are shown in Fig. 4. Note the similar incremental



VACUUM PUMPS have accurate delivery rate but are beset by troubles. Fig. 5.



Contract Research, Development and Fabrication

of instrumentation in the Petroleum Industry

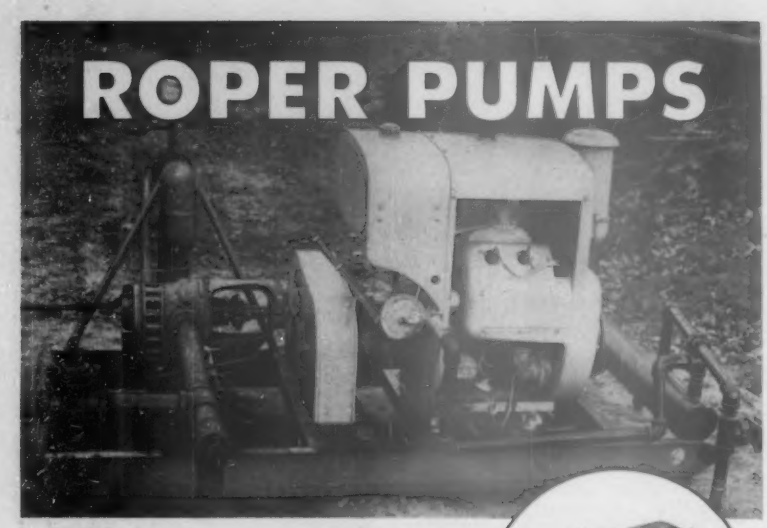
Specializing in the fields of mechanical, electronic, optical, and electro-mechanical development.

BALL BROTHERS RESEARCH CORP.

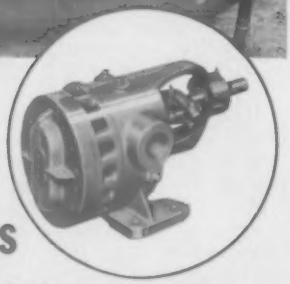
INDUSTRIAL PARK • BOULDER, COLO.
Hillcrest 2-2966

A subsidiary of
BALL BROTHERS COMPANY, INC.

ROPER PUMPS



SERIES H-35 Spec. 5



meet pipeline gatherers' requirements for low capacity and high pressure

CAPACITY: 9-142 BPH • PRESSURES TO 1000 PSI

This crude oil gathering unit consists of a Model VH4D Wisconsin Power Unit short-belted to an H-35 Spec. 5 Roper rotary pump, all mounted on a structural steel skid. The capacity of this unit is 30 bbls/hr. at 600 PSI. This unit is extremely popular due to the low capacity and high pressure requirements of many pipeline gatherers. Roper Series H pumps are used widely in oil field gathering line service where pressures up to 1000 psi are required, and they can be direct connected, belt, chain or gear-driven. Both mechanical seal and packed box available in all sizes.

"PAY-OUT" FEATURES OF ROPER PUMPS

- Roller bearings and bronze wear plates, two on each side.
- Journal and bearing continuously lubricated by hydraulic action.
- One-piece backplate permits removal of internal parts without disturbing piping or drive.
- Hardened and ground gears, operating in axial hydraulic balance, provide highest volumetric efficiency at high pressures.

For information about your specific pump needs, contact your nearest Roper dealer

Send for "How to Solve Pumping Problems" booklet

ROPER HYDRAULICS, INC.

Dependable pumps since 1857

COMMERCE, GEORGIA

delivery rates for three turns of the adjusting screw.

The basic fault with this method is that no two pumps started off with the same initial delivery rate.

Vacuum pumps have a more accurate delivery rate than pumps with sight feeds on the discharge of the pumps (Fig. 5). The drop in a vacuum pump is a free-falling drop within the vacuum and should be more consistent in size. Therefore, the delivery rate should be more uniform.

A number of operating difficulties were encountered while running tests on these vacuum pumps. They included loss of vacuum on the suction side and failure on the pump to deliver oil even though the vacuum sight feed indicated proper functioning of the pump. The difficulties were readily resolved but the tests were plagued with repeats of these difficulties. Field reports consistently indicate that this type of pump continues to give trouble.

Force-feed lubrication requirements can be based on the measured quantity of makeup oil to the lubricator reservoir but not on a true delivery rate from the reservoir by each individual pump. Poor lubrication is not the fault of the operator but of present equipment including devices that have been used to control the delivery rate from the reservoir.

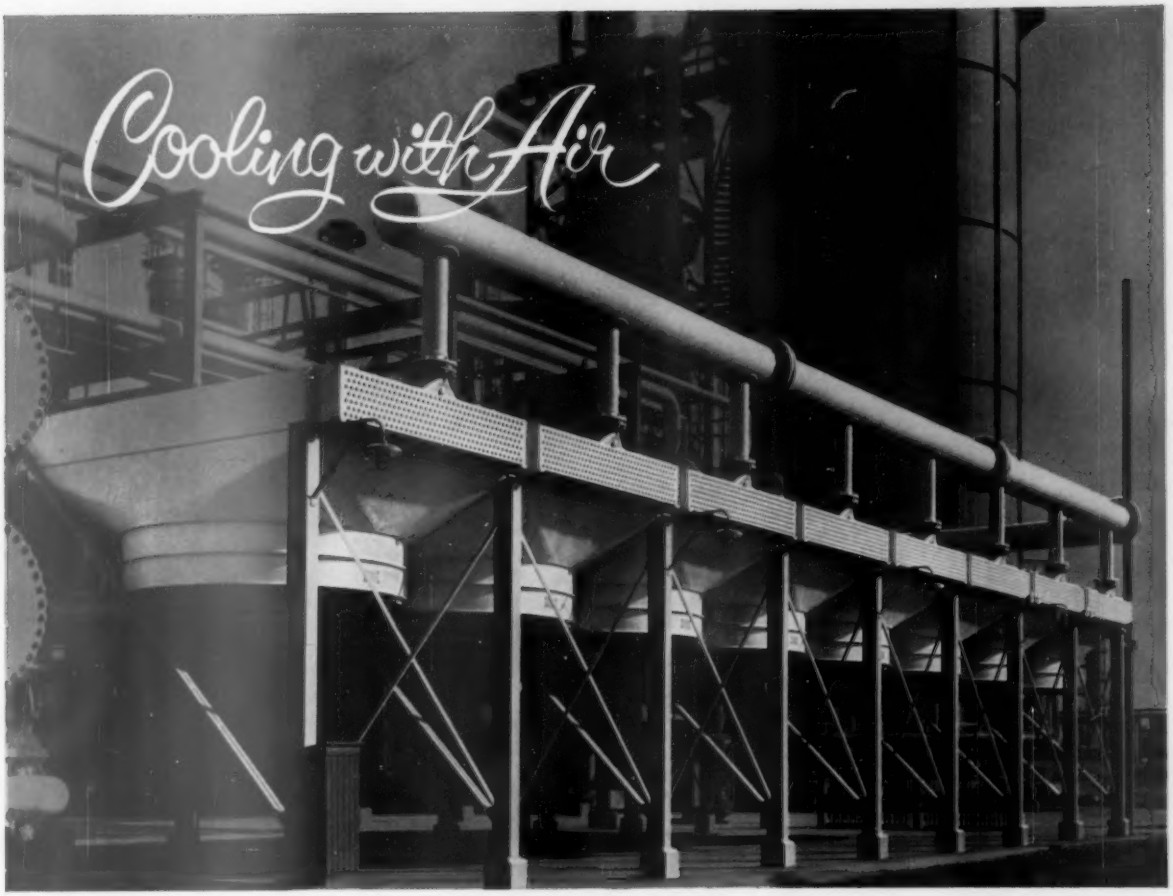
Proper lubrication is important to efficient operation. It can be obtained only through accurately controlled, continuous delivery of oil to the cylinders at the lubrication points.

Exercise care with alloy chain

EMPLOYES who use alloy chains for overhead lifting should observe these safe practices:

Estimate the load carefully. Select chain with suitable load strength. Use chain long enough to provide a maximum angle between the chain and the horizontal. Never shorten chain with knots or bolts. Examine the chain for defects. Hitch the chain securely to the load. Pad sharp corners.

Be sure the load is centered in the bowl of the hook. Watch for kinks and twists. Keep hands and fingers from beneath the chain and the load. Stand clear of the load when it is being lifted. Lift without jerking. Never drag chain over the floor.



IN THE BAYWAY REFINERY...

of the Esso Standard Division of Humble Oil and Refining Company.

The above pictured installation of HUDSON Solo-aire units obviated costly addition to the existent and comparatively high-maintenance-cost water system.

Over-all economic comparisons of HUDSON Solo-aire cooling versus water cooling almost invariably result in selection of Solo-aire units for much or all process cooling.

In two complete 40,000 barrel seaside refineries constructed abroad, Solo-aire units are used for ALL process cooling services. NO WATER IS USED FOR PROCESS COOLING.

In the United States in a 40,000 barrel refinery built adjacent to an unlimited water supply, 50% of the total dissipated heat is transferred directly to air through Solo-aire units.

Operating results of thousands of HUDSON Solo-aire units installed in oil, gas and chemical plants throughout the free world have established HUDSON leadership in the field of direct cooling with air.

ONLY HUDSON designs and manufactures ALL THREE categories of cooling equipment . . . for cooling solely with air (Solo-aire); for cooling primarily with air but with minimum water to obtain low effluent process stream temperatures (Combin-aire); and water cooling towers. Take advantage of HUDSON'S objective assistance in selecting the integrated cooling system which best balances capital investment and operating cost for the specific process, climatic, and water conditions.

HUDSON

ENGINEERING CORPORATION

BRAEBURN STATION • HOUSTON, TEXAS

OFFICES: 16033 Ventura Blvd. Encino, California • 122 East 42nd St. New York 17, N. Y. • 199 Bay Street Toronto, Ontario, Canada • 17 Stratton St. Piccadilly London W. 1, England • Corrientes 1115 Buenos Aires, Argen. • Rua Mexico 45 Rio de Janeiro, Brazil

Unaflo oil-well cement,

CEMENTING DATA

Job — Hattie S. Welch #1, Jefferson Davis Parish, South Louisiana

Drilling Contractor — The Bullard Drilling Co., Inc., Houston, Texas

Owner — Austral Oil Company Incorporated, Houston, Texas

Job #1 — 7⅝" O.D. casing string set at 10,277' in 10⅝" hole, cemented with 500 bags UNAFLO cement plus 6% gel (slurry wt. 14.7 lbs/gal.) followed by 200 bags UNAFLO cement neat, (16.3 lbs/gal.). Drilling mud wt. 13.4 lbs/gal. Schlumberger temp. log 181° F. Est. static BHT 213° F.

Job #2 — 5½" O.D. liner, 2,146' long, bottomed at 12,000' in 6¾" hole cemented with 320 bags neat UNAFLO cement. Drilling mud wt. at cementing 16.4 lbs/gal. Schlumberger temp. log 255° F. at 12,160'. Est. static BHT 265° F.

Job #3 — 5½" O.D. full casing string tied to top of 5½" O.D. liner, using liner to casing coupling with 100 bags neat UNAFLO cement.

compatible with various additives...

UNAFLO oil-well cement is successfully used neat or with various types of additives in more and more cementing operations. For cementing casing or liner, squeeze cementing, plug-backs or recementing, UNAFLO cement slurries pump easily and set hard to provide an adequate seal. Its retarded set sustains high initial fluidity despite high temperatures and pressures. This allows time for proper placement plus a margin of safety for delays or emergencies.

For more information, write Universal Atlas Cement, 100 Park Avenue, New York 17, N. Y.

Universal Atlas Cement
Division of
United States Steel

U-163

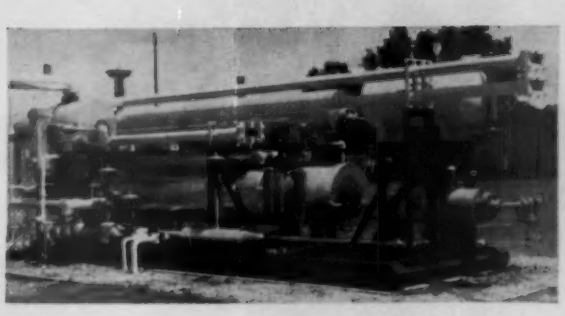
"USS" and "Unaflo" are registered trademarks

OFFICES: Albany · Birmingham · Boston · Chicago · Dayton · Kansas City · Milwaukee · Minneapolis · New York · Philadelphia · Pittsburgh · St. Louis · Waco

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

Hydrocarbon-extraction unit



. . . now on the market as a packaged off-the-shelf unit uses the compression refrigeration cycle principle to recover liquids from wet-gas streams. The Belex unit consists of three packages to simplify field installation. These are the chiller which is piped, insulated, and aluminum jacketed, the compressors with drive and refrigerant interstage air cooler, and the water cooling towers with drive. Each of the packages handles a separate part of the over-all function.

Rated at 1.5, 3.5, and 7.5 M.M.s.c.f.d. as matched units, the packages can be interchanged to meet different gas compositions. Potential uses include dehydration of gas to pipeline specifications, processing of gas from small reservoirs, and processing of separator gas for recovery of liquids. Source: **J. B. Beaird Co., Inc., Box 1115, Shreveport, La.**

Buttress thread tubing

. . . available for use in oil and gas wells. According to the maker, this type of thread-on tubing offers a number of advantages. The thread is applied to plain end, nonupset tubing and permits pipe and couplings to be stabbed together on normal drop impact without thread damage or cross-threading. Maximum well clearance is provided yet the full inside diameter of conventional tubing is provided for maximum flow.

Additionally, the pipe is said to be easily rethreaded in the field, and pipe-coupling joints can be made up and broken in the field at least 12 times without thread damage.

Joint strength of the buttress-thread tubing is about 98% of the pipe body strength. The threads in the couplings are tin-plated to prevent leaks. They are designed to withstand pressures up to 15,000 psi.

The buttress threads have a 0° pulling face and a 45° flank angle on the compression side with broad flat roots and crests parallel to the major pipe axis. The buttress-thread tubing is now available in three grades, J, N, and P, and in two sizes, 2⅜ and 2⅞ in. Source: **National Tube Div., U. S. Steel Corp., 525 William Penn Place, Pittsburgh 30, Pa.**

●

Latest tank-truck hose

. . . on the market for gasoline and oil is a combination pressure and suction type with a braid - wire - braid construction that is said to give the hose a constant burst pressure. The burst pressure of the Type 24 HW hose is said to be maintained under any degree of bending radius. The maker reports that the new hose construction prevents splitting or cracking. Source: **Gates Rubber Co., 999 S. Broadway, Denver 17, Colo.**

Engine provides easy access

. . . through use of a hinged engine canopy. Hinged at the front end of the pedestal-mounted engine, the canopy swings clear to permit access to the engine for maintenance.

The 36-b.hp. diesel engine, made in England, has three cylinders and a 152 - cu. - in. displacement. Potential uses include powering pumps and

Want more facts about equipment or copies of product literature described in this issue?

Send this **Showcase Coupon**

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number: .....

.....

Described in OIL AND GAS JOURNAL - Issue of **December 5, 1960**

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

NORTH, SOUTH, EAST AND WEST—

OPERATORS GET FAST PAYOUTS, GOOD PROFITS

You increase net profits when you perform successful workovers on your wells. Dowell services, products and engineering aids are designed to help you get those added profits. Here are results from a few of many recent jobs.

OPERATOR NETS $4715 IN 90 DAYS FROM ABRASIJET AND ACIDIZING BY DOWELL

ALBERTA, CANADA. Three old wells in the Redwater pool produced an *extra* 4520 barrels of oil in 90 days as a result of Abrasijet*—Dowell's abrasive jetting service—and Dowell acidizing treatments. After deducting total workover and treatment costs from added revenue of $10,115, a net profit of $4715 was realized.

DOWELL SAVES GAS WELL— GETS 10-DAY PAYOUT

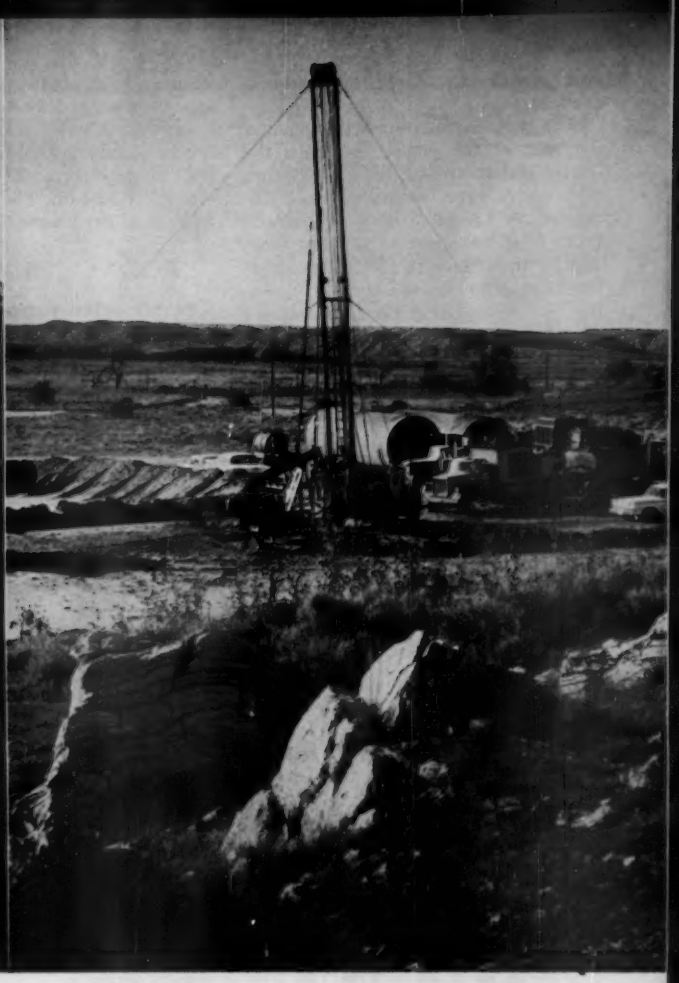
SOUTH TEXAS. A Dowell frac job made a 2,750 mcfd producer out of an old Frio well that was practically dead and non-commercial. Payout on treatment was estimated at 10 days.

DOWELL FRAC JOB BRINGS NEW LIFE TO 40-YEAR-OLD GAS WELL

WEST VIRGINIA. 850 mcfd open flow and 200 mcfd delivered into line resulted when Dowell fractured a practically dead 40-year-old gas well. Treatment cost was paid out in less than 30 days.

TREATMENTS WITH VERSENE 100 GIVE 35-DAY PAYOUTS IN PERMIAN BASIN

WEST TEXAS. Average payout of ten treatments by Dowell using Versene® 100 was 35 days. Versene 100 is a chemical used to remove calcium sulfate, calcium carbonate and other scales from wells. Average production increase was 9.7 bopd and treatment costs were between $550 and $875. Net value of oil was assumed to be $2.00 per barrel.



WITH DOWELL WORKOVER TREATMENTS

DOWELL USES "ACID GUIDE"* TO GET FAST PAYOUT ON THREE PROBLEM WELLS

NORTH DAKOTA. Payouts of 55, 23 and 65 days were realized from treatments with Retarded Acid of three old wells in the Madison lime of McKenzie County. Previous treatments using regular acid in the same field had failed to pay out.

NEW ACID TREATMENT SAVES OPERATOR ABOUT $400 PER MONTH ON WATER DISPOSAL WELL

SOUTHEASTERN NEW MEXICO. A single $735 treatment replaced three $650 monthly treatments on a Lea County disposal well. By substituting Stabilized Acid and a surfactant wash for regular acid, life of the job was tripled at an extra cost of only $85. Savings averaged about $400 per month.

FRAC JOB PROVIDES EXTRA GAS AT THREE CENTS PER THOUSAND

NORTH LOUISIANA. 105 mmcf of *extra* gas was produced in four years from a well in the Monroe Gas Field. Reason for this extra production was a Dowell frac job performed in March, 1956. Based on treatment price, the extra gas cost the operator three cents per thousand. 39 similar wells fractured early this year promise to be at least as profitable as the 1956 job.

Talk over your workover problems with your Dowell representative. He will show you how Dowell can use new ideas and techniques to help you cut costs and increase revenue. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina and Germany. Dowell, Tulsa 1, Oklahoma.

* Dowell Trademark

Services for the oil industry

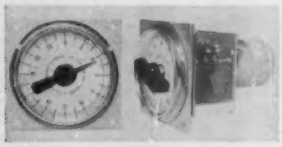
DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

compressors. A variety of clutches are available.

The engine control panel, located at the rear of the engine, contains the heater starter switch, throttle control, oil-pressure gage, ammeter, and tachometer. A 12-volt electrical system is used. It is belt-driven from the front end of the crankshaft. The starter is flange-mounted to the flywheel housing. A 7½-gal. fuel tank is mounted above the engine. Source: **Perkins Engines Ltd., Peterborough, Northants, England.**

●



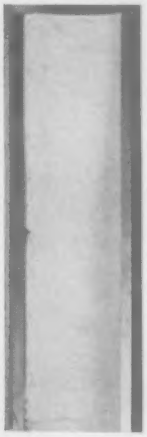
Seconds or days timed

. . . with a new timer now on the market in England. The Type NHR timer uses continuously adjustable timing cams and is fitted as standard with one or two changeover microswitches.

Up to 12 timed circuits and 12 changeover microswitches can be provided. Before each operation, the timer is preset by hand to the required timed interval. The pointer returns to zero during the timing period. This action gives an indication of the progress of timing. Switching capacity is 6 amp. at 230 volts a.c. Time ranges are obtainable from 0-30 seconds to 0-12 days. Source: **Electrical Remote Control Co., Ltd., The Fairway, Bush Fair, Harlow, Essex, England.**

●

Construction material



. . . a ceramic - metal composite called Nucerite, is said to combine structural strength and resistance to impact damage with resistance to attack in hot, corrosive environments. It is expected to prove particularly useful in chemical - plant applications where presently available materials limit processing temperatures.

In laboratory tests, the material has shown a number of promising features, according to the maker. The ceramic component has withstood, in rod form, more stress without permanent deformation than has mild steel.

The material can be used in glassed-steel equipment by being chemically bonded to steel or other heat-resistant metals in the same way as the maker's glasses. Source: **Pfaudler Co., 1118 West Ave., Rochester, N. Y.**

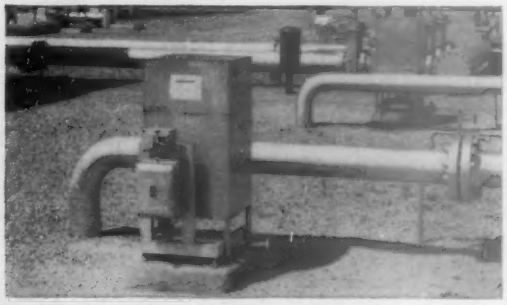
●

New type of oil seal

. . . for oil-field pumping units makes possible sealed-in-oil lubrication of wristpin bearings on pumping units, in place of grease-gun lubricants that need frequent field service.

The seal has two hardened ferrous-metal sealing rings. These maintain an oiltight seal that is self-adjusting for wear under constant pressure from

For blending crude oil products...



NEW SINCLAIR-CENCO

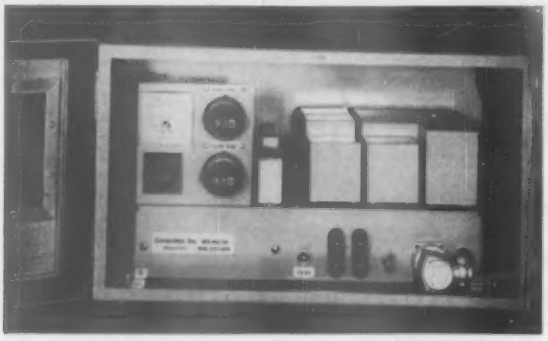
Gravitometer

Blends crude oil products and other liquids to constant outgoing gravity. Records outgoing gravity to 60°F regardless of flowing liquid temperature. Response time, 30-35 seconds. Manufactured and sold by Cenco under license by Sinclair Research Labs, Inc.

No. 35090 Each $3750.00

cenco

REFINERY SUPPLY CO.
A Subsidiary of Central Scientific Co.
621 East 4th Street • Tulsa 20, Oklahoma
6610 Stillwell • Houston 17, Texas
Mountainside, N. J., Somerville, Mass.
Birmingham, Santa Clara, Los Angeles, Chicago



Flow Measuring System—Model 257

ACCURATE GAS FLOW MEASUREMENT WITH LOCAL OR REMOTE DIRECT READOUT

- Fast response
- High accuracy
- Plug-in components for easy maintenance
- A.C. or D.C. models available
- Integrated volume in cubic feet
- Instrumented for use with single orifice plate or multiple meter runs
- Flow rate indication

To learn more about modern gas flow measurement for automatic well testing, gas lift, sales and purchase, contact

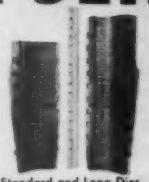
COMPUTERS, INCORPORATED
3407 South Shepherd Drive • Houston 6, Texas

AIR OPERATED
KELCO POWER SLIPS

Slip bowl assures positive alignment of the slips with drill pipe. Eliminates "Bottle-necking". KelCo's safety latch *works!*

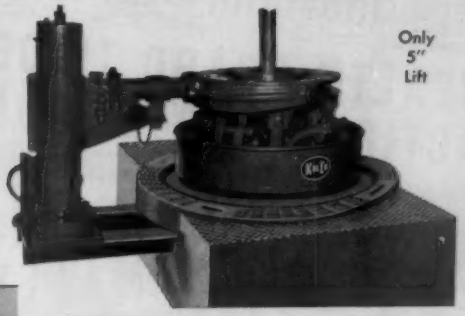
Available Through Your Preferred Supply Store

Write For Free Catalog and Price List



KelCo's Standard and Long Dies Give More Pipe Contact

Standard and Long Dies



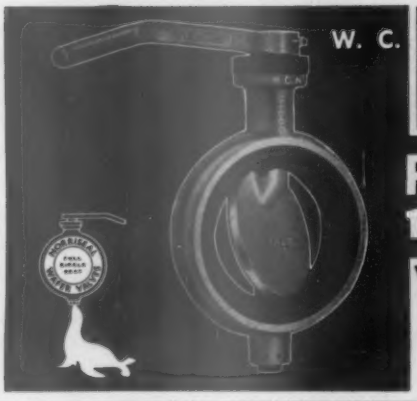
Only 5" Lift

Model J-6 (Illustrated)
Model J-6-J Slim-Hole Power Slips Also Available

Catheads
Power Slips
Tubing Tongs

KELCO — BE SAFETY WISE

BEN F. KELLEY CO., INC.
10 South Madison
TULSA, OKLAHOMA



W. C. NORRIS VALVES

Field Tested and Approved
150 psi working pressure

WRITE FOR NEW VALVE BULLETIN
P. O. Box 1739, Tulsa

Contains the facts and data you need . . .

PROJECT ENGINEERING OF PROCESS PLANTS

By
Howard F. Rase
and
M. H. Barrow

1957.
692 pages.
Illus.
$14.25.

The first book on process plant design which formalizes the new profession of project engineering and is in accordance with modern techniques of project organization, planning, and execution.

THE OIL AND GAS JOURNAL
Reader Service Department
P. O. Box 1260 Tulsa, Okla.

AUTOMATIC TITRATOR

quickly measures petroleum bromine numbers

A versatile coulometric titrator especially suited to determine the olefin content of gasoline as bromine number. With the flick of a switch, reaction time registers in tenths of seconds directly on the titrator, rapidly, accurately, and automatically. This Cenco instrument is capable of titrating a wide range of olefins as well as mercaptans without the use of standard solutions. #20928-2 with electrodes $695.00

Licensed under patent rights Standard Oil Co. (Ind.)

cenco

REFINERY SUPPLY CO.
A Subsidiary of Central Scientific Co.
621 East 4th Street • Tulsa 20, Oklahoma
6610 Stillwell • Houston 17, Texas
Mountainside, N. J., Somerville, Mass.
Birmingham, Santa Clara, Los Angeles, Chicago

HEALTH BOARD TO DEMAND ACTION IN POLLUTION CASE
CRIMINAL NEGLIGENCE CITED AGAINST FIRM IN EXPLOSION
FACTORY'S WASTE DISPOSAL BLAMED FOR WATER POLLUTION
SMOG RESPONSIBILITY LAID TO IMPROPER WASTE DISPOSAL

WASTE DISPOSAL . . . A MAJOR PROBLEM IN THE PROCESSING INDUSTRIES

As local air and water pollution regulations become more stringent, the efficient disposal of waste products becomes an increasing problem. Safety for plant and personnel is also an important aspect of waste disposal. Danger to your employees from noxious fumes . . . the possibility of explosions . . . are constant hazards when waste disposal is not properly handled.

WHAT IS THE ANSWER?

Let John Zink engineers solve your special waste disposal problem.

Each process has its own waste materials. Each plant has its own physical limitations as to space, available fuels, etc. Each community has its own legal restrictions.

The only sensible answer is a waste disposal unit designed to meet *your* individual requirements.

The John Zink Company has been a leader in the waste disposal field for more than a quarter of a century. One of the first to recognize and solve this problem, John Zink engineering and research has met the waste disposal needs of processors throughout the world with units of standard or custom design for maximum efficiency and safety.
WRITE FOR BULLETIN WD-560

COMPLETE RESEARCH FACILITIES . . .

The country's most complete research and test center devoted exclusively to combustion problems . . . your assurance of a workable solution to your special combustion problems.

Combustion Specialists for over a quarter of a century

JOHN ZINK COMPANY

4401 SOUTH PEORIA / TULSA, OKLAHOMA

Representatives in all major cities

two oil, heat, and cold-resistant rubber O-rings. Source: **Pumping Unit Div., Parkersburg Rig & Reel Co., Coffeyville, Kan.**

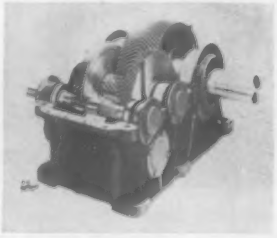
●

Pressure switches

. . . in 2 types are now available for pneumatic or electric control. Both are diaphragm operated. The Model Cadm switch is equipped with a three-way snap action valve for pneumatic control systems while the Model Cadmex is equipped with an explosion-proof switch for electric control.

The maker's standard pressure range is 6-to-15 psi. However, a 15-to-25 psi. range is available too. The switches are designed so measured pressure enters the lower diaphragm chamber through a ⅛-in. NPT port. When lower-chamber pressure overcomes spring tension in the upper chamber, a lower drive collar operates the switch. Pressure required to operate the switch can be adjusted within the pressure range by a screw atop the unit. Source: **Instruments, Inc., Box 556, Tulsa, Okla.**

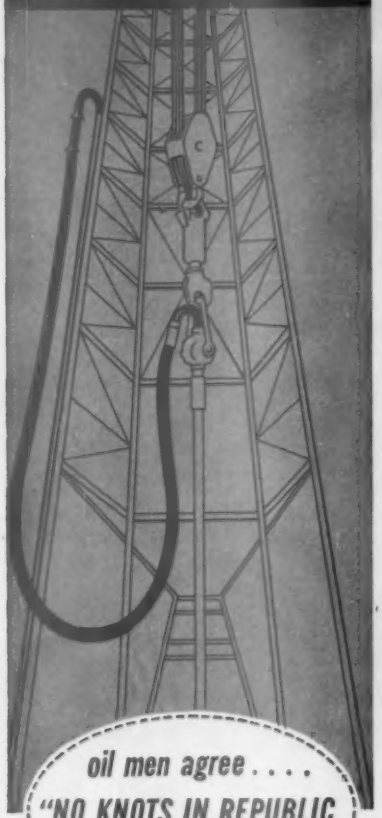
●



Speed reducer in 57 sizes

. . . permits drive selections to be closely matched to horsepower requirements. The parallel shaft type of speed reducers come in single, double, and triple-reduction units, in capacities to 2,800 hp. at high or low speeds, and in ratios to 292 to 1.

REPUBLIC ROTARY HOSE



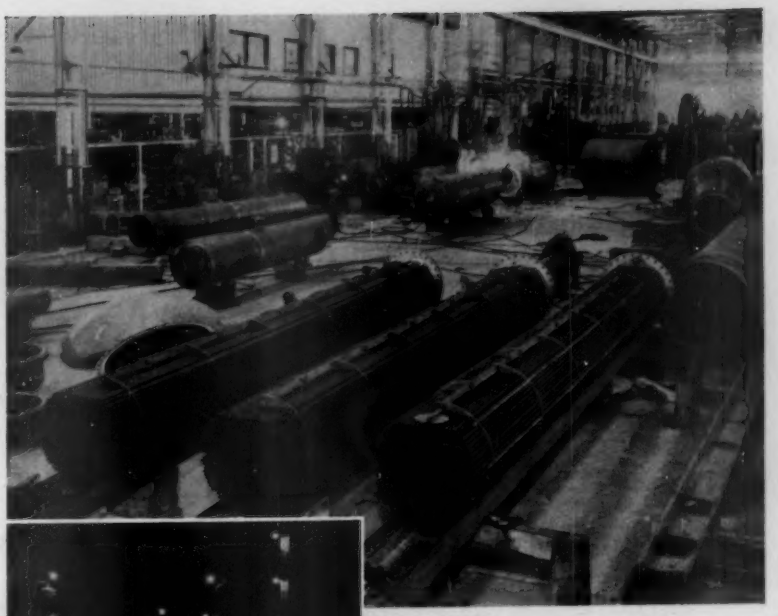
oil men agree . . . .
"NO KNOTS IN REPUBLIC HOSE!"

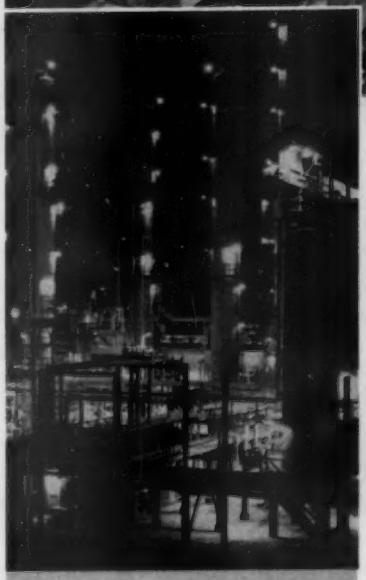
Equal tension on each steel cable prevents knots.

REPUBLIC RUBBER

DIVISION, LEE RUBBER & TIRE CORP.
YOUNGSTOWN 1, OHIO

For information on Rotary, Mud Pump Suction or Vibrator Hose, write to: Republic at Youngstown or check your local J & L Supply Store.





HEAT EXCHANGERS

BUBBLE TOWERS

PRESSURE VESSELS

FRACTIONATING COLUMNS

FLINT can fabricate any type of petroleum and chemical PROCESSING EQUIPMENT

More than forty years of manufacturing experience, the largest and the most modern plate shop facilities in the Southwest enable Flint to design and fabricate, to code, and meet delivery requirements competitively.

Fabricated Structural Steel
Fabricated Galvanized Steel
Steel Service Center

Write for booklet describing Flint's new steel fabricating facilities.

FLINT STEEL

P. O. BOX 1289 • LU 4-3621
TULSA 1, OKLAHOMA

STEEL PLATE FABRICATORS ASSOCIATION

SPECIALISTS IN STEEL FOR INDUSTRY

ALGO*

FOR THE BENDIX G-15 COMPUTER

Speeds and Simplifies Problem Solving

ALGO extends the problem-solving horizon of every engineer, focusing the speed and precision of the Bendix G-15 computer on any algebraically stated problem. ● A true mathematical equation solver, ALGO permits any engineer or scientist to program the computer in universal mathematical language. No previous knowledge of computers or programming is needed. Input/output, computation and data handling are all automatically controlled by the G-15 computer. ● Compare the number of steps in the ALGO program illustrated below with the number required to solve the same problem on a slide rule, desk calculator or any other computing system. You will see the time and cost-saving significance of this new Bendix G-15 automatic programming aid. ● Specifically designed to take advantage of the computing power and flexibility of the proven G-15, ALGO is the newest addition to an extensive library of Bendix automatic programming systems. See how the low-cost Bendix G-15 and ALGO combine to broaden application boundaries. Learn how this powerful team can save you valuable time . . . and greatly simplify problem solving.

* AN ALGEBRAIC COMPILER BASED ON INTERNATIONAL ALGOL.

PROBLEM: $$I = \frac{E}{\sqrt{R^2 + (6.2832\,FL - 1/6.2832\,FC)^2}}$$

(For values of R F & L as specified. For values of E ranging from 100 to 300 in increments of 50. For values of C ranging from .00002 to .000021 in increments of .0000001)

COMPLETE ALGO PROGRAM:

```
BEGIN (S)
R = 10 (S)
F = 60 (S)
L = .2 (S)
FOR E = 100(50)300 BEGIN (S)
FOR C = .00002(.0000001).000021 BEGIN (S)
I = E/SQRT(R ↑ 2 + (6.2832 * F * L — (1/(6.2832 * F * C))) ↑ 2) (S)
PRINT (FL) = E (S)
PRINT (FL) = C (S)
PRINT (FL) = I (S)
```

Write on your letterhead for the self-teaching ALGO manual.

Bendix Computer Division
DEPT. AK-23 LOS ANGELES 45, CALIFORNIA

THE Bendix CORPORATION

The shafts can be arranged to suit specific drive requirements. The reducer design is such that the unit can be assembled with a single-shaft projection in either direction or with double-shaft projections. Source: **Link-Belt Co., Prudential Plaza, Chicago 1, Ill.**

●

Remote control unit

. . . now being sold provides both control and status indication of valves, motors, blowers, pumps, and other devices with only two wires between the remote point and the central control location, the maker reports. The remote indicating control unit is packaged with a graphic-symbol front cover ready for immediate use in a central graphic panel.

Either incandescent or high-intensity neon bulbs are used at the central location. In most cases, the remote-point chassis may be mounted in the controlled-device housing. Maximum loop line resistance may be up to 100 ohms for incandescent indications or 2,000 ohms for neon indicators. Source: **Texas Instruments, Inc., 3609 Buffalo Speedway, Houston 6, Tex.**

Tubing corrosion detected

. . . with a mechanical type of detector recently developed which is run in the well on wire-line equipment. Calipers are available for measuring corrosion in four tubing sizes: 2, 2½, 3, and 3½ in.

Among the improvements in the Microscopic caliper is the addition of a recording stylus for each of the measuring feelers. This results in a greatly improved degree of accuracy, according to the maker, and in the ability to measure corrosion that has occured all around the tubing.

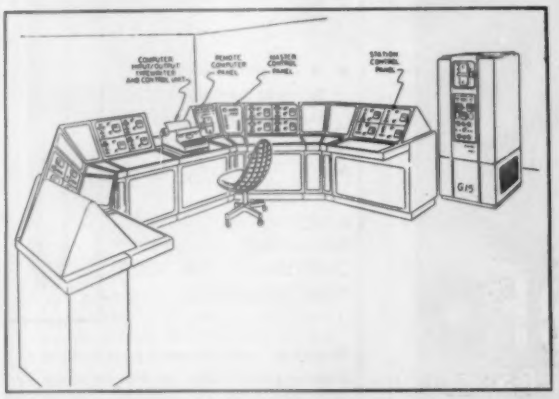
The maker points out that, since corrosion can be recorded around the circumference, an easily read cross-sectional drawing of tubing conditions can be plotted at any level in the well. The caliper is said to permit surveying of as much as 15,000 ft. of tubing on a single run. Source: **J. C. Kinley Co., 5815 Royalton, Houston 36, Tex.**

●

New aid for air drilling

. . . has been developed, a foaming agent formulated for air and gas drilling in the presence of salt water. The product, Afrox-200, is claimed to convert salt water with Hp to 10% oil contamination into aerated foam.

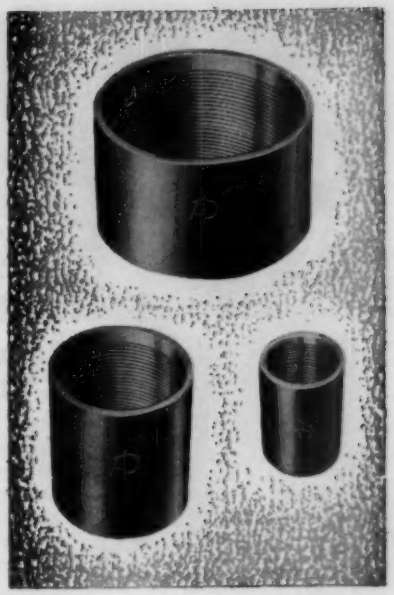
According to the maker, salt-water intrusion of 50 to 60 bbl. an hour can be handled under normal conditions. Source: **Atlas Powder Co., Box 21072, Houston 26, Tex.**



New blending system

. . . for refineries and petrochemical plants recently developed makes use of a general-purpose digital computer for automatic process control. The system employs the maker's G-15 computer and can be used in any process multichanel-blending.

Control of the ingredient stream, blend composition, and final product blend are accomplished through the use of digital turbine flow meters and piston valves. Besides its use in on-stream measurement and control, the computer automatically tallies and stores in the memory system the flow of all ingredients used. Source: **Computer Div., Bendix Corp., 205 E. 42nd, New York 17, N. Y.**

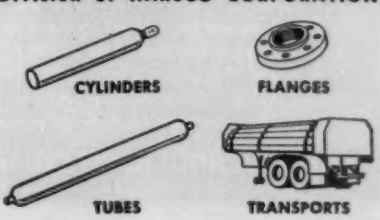


HARRISBURG
COUPLINGS

Harrisburg Seamless Steel Pipe Couplings are manufactured to A.P.I. and A.I.S.I. specifications for petroleum and other industries. The Harrisburg developed process assures uniformity of threading unsurpassed in accuracy of form, height, angle and lead. Order the best — order Harrisburg couplings.

More than a Century (H) in Harrisburg 6, Pa.

HARRISBURG STEEL CO.
Division of HARSCO CORPORATION



Mild Steel Outlasts Stainless!

The Colmonoy Spraywelder applies powdered nickel-base alloys smoothly and quickly. Overlays are then fused and ground.

Left: mild steel sleeve with Colmonoy No. 6 overlay after 395 days service. Right: stainless steel (316) sleeve after only 105 days service.

COLMONOY HARD SURFACING CUTS PUMP SLEEVE WEAR

Much longer wear and fewer packing changes are the results reported in using Colmonoy hard-surfaced mild steel pump sleeves in a Desalta charge pump where stainless steel sleeves were used before. Maintenance costs are now considerably lower. Compare the two pump sleeves in photo.

Colmonoy alloys and methods can protect your equipment, save you money. Write for the Spraywelder Catalog and the Colmonoy Hard-Surfacing Manual today.

HARD-SURFACING & BRAZING ALLOYS

WALL COLMONOY CORPORATION

19345 JOHN R STREET • DETROIT 3, MICHIGAN

Buffalo • Chicago • Houston • Los Angeles • Morrisville • New York • Pittsburgh • Montreal • London, England

imagine a gas scrubber with no moving parts or filters!

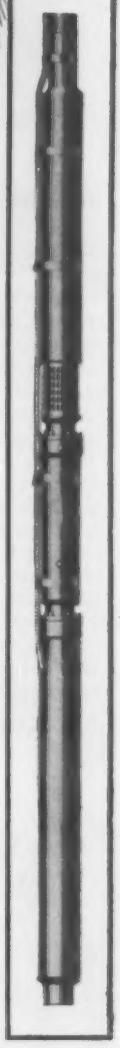
Hi-eF PURIFIERS

Once installed Hi-eF Purifiers scrub gas at virtually no maintenance cost. There are no screens to clean or filters to replace. Scrubbing is accomplished without use of moving parts. Investigate this low-cost way of keeping pipeline processes absolutely clean. SPECIFICATION MANUAL 601 contains data on seven leading types of purifiers, separators, mist extractors, scrubbers. Write.

THE V. D. ANDERSON CO. 1977 West 96th Street, Cleveland 2, Ohio

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION

INCREASE PROFITS WITH REDA Submergible PUMPS



REDA GIVES YOU THESE COST SAVING FEATURES AND DOES THE JOB BETTER!

- **Lower cost for installation, operation and maintenance.**
- **250 to 18,000 BPD capacities**
- **Depths to 10,000 ft.**
- **Corrosion-resistant construction**
- **Long life — dependable service**
- **A complete line to meet pumping requirements**

and

INVESTMENT COST IS FAR LOWER WHEN YOU CHOOSE REDA FOR YOUR PUMPING NEEDS.

Write or call for more information. Reda engineers will be pleased to assist and help plan your operations.

SIGN OF QUALITY SUBMERGIBLE REDA PUMPS

REDA PUMP CO.

BARTLESVILLE, OKLAHOMA

Manufacturers of submergible motors and pumps for over 35 years — for oil, brine and water wells, gasoline and jet fuel.

SHOWCASE . . .

New Literature

Organic-chlorine-compounds

. . . data is presented in a new 44-page booklet that describes the use of 13 such compounds as solvents, extractants, fumigants, intermediates, and special-purpose fluids. Included in the data are physical properties, cleaning formulations, toxico-logical properties, shipping, storage and handling, test methods, selected literature references. Source: **Union Carbide Chemicals Co., 30 E. 42nd St., New York 17, N. Y.**

Bulk-material handling

. . . booklet details all ramifications of the Tote system as an inplant and interplant system; as an automated system; as distinct storage units; discharge hoppers; and shipping containers. The 32-page literature explains filling, discharging, storing, shipping, and automating Tote Bins in various plant situations. It also contains a form for estimating costs versus savings in any given plant. Catalog 8 offers photos and diagrams which show the system in operation, along with special applications and adaptations of both liquid and dry materials handling Tote Bins. Source: **Tote System, Inc., Beatrice, Neb.**

Metal flexible hose

. . . products are featured in new 20-page Catalog ID-100D available now. It describes hose to convey gases, solids and fluids; for vibration control; and to compensate for motion or misalignment under high temperature, pressure, vacuum, or abrasive conditions. The literature gives detailed descriptions, specifications, and applications together with coupling recommendations. Source: **Universal Metal Hose Co., 2133 S. Kedzie Ave., Chicago 23, Ill.**

Lightning Facts and Figures

. . . is the title of a free 20-page pamphlet to help you become more familiar with "nature's artillery." Its 32 chapters deal with safety rules, properties of lightning, explanation of the bolt itself, and the amount of electricity it produces. The literature also explains how lightning's core produces a stream of light, how thunder is produced, and how positive and negative electrical charges build up. Source: **Lightning Protection Institute, 53 W. Jackson Blvd., Chicago 4, Ill.**

Truck-cost record books

. . . and forms for driver daily reports to assist truck users in evaluating the performance of their equipment, are now being offered free. The truck-cost record book—Form AD-20—consists of 20 pages. Each book allows an accurate record to be kept of all fixed, operating, and maintenance charges against one truck for a full year. The daily driver report—Form AD-26—may be used in conjunction with the record book. It provides space for reporting information such as number of trips, trip time, number of stops, mileage, loads, and fuel and oil consumption. Source: **International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.**

Pipe-fitters manual

. . . gives text, tables, and illustrations for mathematical, physical, chemical, and metallurgical data and related design, layout, and mechanical information at a glance. The 72-page pocket size field manual covers characteristics of welded and threaded piping; basic mathematical formulas and conversion factors; dimensions of welding fittings and flanges and commercial pipe sizes; electrode data and practical tips on welding and properties of pipe, metals, and fluids. Illustrations show methods of pipe alignment, types of pipe hangers, and commonly used drafting symbols for arc

THIS FILE HOLDS 2000 ELECTRIC LOGS

KRAFTBILT E-24 holds 2000 full-sized logs (Schlumberger, Lane-Wells, Halliburton or others). Separate follow-blocks in each drawer give eight drawer efficiency. Extra-strong extension for fingertip control, easy sliding. Fire resistant all-steel construction.

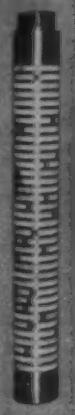
Other electric log file cabinets available — also custom-made file folders and dividers for greatest efficiency.

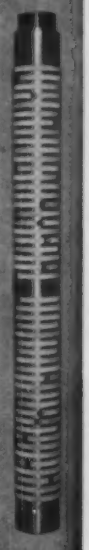
For CATALOG 59-B, write:
Dept. J-449

ROSS-MARTIN COMPANY
P.O. BOX 800 TULSA, OKLAHOMA

Let R-u-b-b-e-r Take The Wear in your sucker rod pumps

IT COSTS YOU LESS THAT WAY





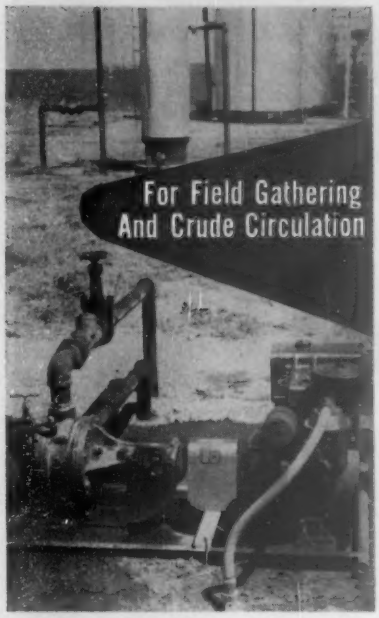
● MARTIN RUBBER & DUCK RINGS give excellent life in dirty abrasive fluids . . . high or low gravity . . . much or little water . . . shallow or deep wells. They last for years in the easier pumping wells. Replacement rings cost comparatively little.

● MARTIN PLUNGER BODIES, precision grooved, drilled and threaded (no underneath fluid passage), usually last for years. Tube or barrel costs are often cut in half.

● The replaceable SYNTHETIC RUBBER GUIDES in MARTIN CAGES last longer than any metal, and the cushioning of the ball increases your ball & seat life. Results are often truly amazing. (Patent No. 2,591,174)

Write for our new 1960 catalog or see it in the new Composite (24th Edition). All products sold thru supply companies.

JOHN N. MARTIN
Manufacturer
W. BRADY STREET • TULSA, OKLAHOMA



VIKING PUMPS

with Positive Action

The positive suction of Viking rotary pump action makes it possible to draw from one or several tanks. Delivery can also be made to one or more tanks.

This versatility makes the Viking Pump applicable to any arrangement of gathering tanks, treaters and separators.

Heavy-duty Viking Pump construction lends itself to many mounting and power arrangements.

For information on this complete line of Viking Pumps, send today for catalog CT and SP-523T.

VIKING PUMP CO.
CEDAR FALLS, IOWA, U.S.A.

In Canada, it's "ROTO-KING" pumps

See Your Classified Telephone Directory Offices and Distributors in Principal Cities

and gas welding and for pipe fittings. Source: **Tube Turns Div., Chemetron Corp., 222 E. Broadway, Louisville 1, Ky.**

Grating and stair treads

. . . Bulletin 1112 pictures facilities which include a slitting machine to slit bearing bars from coil steel; equipment to edge, straighten, and cut bearing bars to desired lengths; an automatic welding machine which produces grating with a completely fused weld at each joint; an automated paint line; and engineering personnel at work. The 12-page bulletin lists such applications for grating and stair treads as machinery floors, conveyor systems, operating floors, power plants, operative machinery, refineries, tank walkways, and stairs. Source: **Dravo Corp., Neville Island, Pittsburgh 25, Pa.**

Armored-multitube

. . . bulletin, just off the press, gives complete information on spirally cabled tubes for instrument and control systems in 12 pages. Bulletin 960 contains complete detail on various types of tubing, and protective interlocked metallic armor, types of corrosion-resistant sheaths, and instructions for installation. Illustrations include a general-purpose type for indoor use and four outdoor and corrosion-resistant types, as well as special constructions for underground use. Also shown are various accessories such as terminal fittings, junction boxes, clamps, etc. Source: **Crescent Insulated Wire & Cable Co., 323 No. Olden Ave., Trenton 5, N. J.**

Welding alloy catalog

. . . and instruction manual is now being offered to interested persons. The 4 by 7-in. publication offers physical properties, major uses, detailed application instructions, and the latest techniques for welding, brazing, soldering, cutting, and hardfacing. Charts and tables summarize alloy selection and properties. Products are indexed by major metal use. Source: **All-State Welding Alloys Co., Inc., White Plains, N. Y.**

New mass spectrometer

. . . called the Type 21-110, is detailed in new eight-page Bulletin 21110 just announced. The instrument is designed as a conventional analytical tool for laboratories conducting advanced-materials research. The literature offers descriptions, specifications, performance data, and construction features. Source: **Consolidated Electrodynamics Corp., 360 Sierra Madre Villa, Pasadena, Calif.**

FOR OIL F... SERVICE

Mc Donough Marine Service
P. O. Box 26206
Industrial Canal
at Florida Ave.
WH 9-7586 N. O., La.

S. E. HUEY & CO.
ENGINEERS & SURVEYORS
OUACHITA BANK BLDG.
MONROE, LA.
SURVEYING & MAPPING
PIPE LINE SURVEYS

SECONDARY RECOVERY
PETROLEUM ENGINEERS
STEPHENS ENGINEERING
WICHITA FALLS, TEXAS
RESERVOIR ENGINEERING
Water Flooding Gas Repressuring
EVALUATION CORE ANALYSIS
SURVEYS ECONOMICS
Cost Estimates, Design, Installation
FIELD SUPERVISION
Phone 723-2167

▶▶▶ Equipment Men Notes

F. T. Alexander made manager

... of Hughes Tool Co.'s newly formed southern region, announces W. H. Siems, vice president of sales. Succeeding Wade W. Hampton who retired after 41 years with Hughes, Alexander has been a member of the sales organization since 1935.

F. T. Alexander

He started as a field salesman and became supervisor of tool-joint sales, special tool-joint representative, district sales manager at Lafayette, and southeastern division sales manager. He now will be based in Houston.

Diamond Chain Co., Inc. opens

... a factory warehouse and sales office in Dallas, according to H. N. Cottingham, president and general manager of the Indianapolis-based subsidiary of American Steel Foundries. The 7,500-sq.-ft. warehouse will provide 1-day delivery into a five-state area. Items in stock include roller chain for use on industrial machinery and oil-field equipment for drilling, pumping, and exploration.

National Supply Co. consolidates

... six division sales organizations into four regional organizations, and combines 18 district sales organizations of the former divisions into nine area organizations within the new regions.

The company further set up a special sales office in each of the two largest regions, while appointing regional managers of sales, of stores, of services, and of merchandising at the two locales.

According to Thomas B. Herndon, manager of oil-field sales, a clear-cut distinction is now drawn between selling and administrative duties. Regional sales managers will coordinate activities of city sales offices, sales representatives, specialty salesmen, and service representatives. Regional store managers will be responsible for the profitable operation of the company's oil-field stores.

The former Southwest division, with headquarters at Dallas, and Gulf Coast division, with headquarters at Houston, are consolidated into the new southern region, headquartered at Houston. L. A. J. Monroe is the regional manager, with V. H. Gardner, regional manager of sales; Allen F. White, regional manager of stores; John W. Babb, regional manager of services; and Hugh A. Crider, regional manager of merchandising. A special sales office is being maintained at Dallas, under direction of Joe H. Rogers, area manager of sales.

The former Midwest division, with headquarters at Tulsa, and Northwest division, with headquarters at Denver, are consolidated into the new northern region, headquartered at Denver. Robert D. Stottlemyer is the regional manager, with Richard A. Heckel sales manager; Robert L. Ritchey, store manager; Carey K. McDonald, service manager; and C. E. Scace, Jr., merchandising manager. A special sales office is being maintained at Tulsa, under direction of Kenneth O. Hoevel, area manager of sales.

The former eastern division becomes the eastern region. William D. Crawford is regional manager, with headquarters continuing at Columbus, Ohio. The former western division becomes the western region. Jerry L. Evans is regional manager, with headquarters continuing at Torrance, Calif.

AUTOMATIC STATIONARY COATING AND WRAPPING MACHINE is discussed by R. C. Stanley (left), vice president of Stanley-Bledsoe Corp., and John Brand, vice president of Crose-Perrault Equipment Corp. Crose-Perrault sold two disk-type and one grit-blasting machines to Stanley-Bledsoe for use in external grit-blast cleaning and coating and wrapping of 468 miles of 36-in. pipe for Pacific Gas Transmission Co. The equipment operates at double-jointing plant sites. The contract calls for Stanley-Bledsoe's cleaning and coating of the pipe in 80-ft. lengths.

Edward J. Hart named manager

... of the Radio Corp. of America microwave department, announces J. J. Graham, division vice president and general manager, RCA Communications & Controls Division. Hart joined RCA in 1953 as a microwave sales coordinator.

Graham also announced the appointments of three men who will report directly to Hart: Walter C. Byrne, Jr., manager for microwave marketing; Haddon S. Wilson, custom microwave project manager; and Norman E. Edwards, manager of microwave engineering.

Rockwell names James H. Sells

... district manager in the Houston area for the company's Meter and Valve Division. He has been district sales manager in Kansas City since last year. The promotion was announced by William R. McLaughlin, southwestern regional manager.

J. H. Sells

Sells joined Rockwell Mfg. Co. as a sales engineer and worked in the Houston and New Orleans areas until 1956, when he was named San Francisco district sales manager for the Municipal and Utility Division.

Nordberg Mfg. Co. appoints

... George J. Wooldridge as sales engineer, and Alden G. (Al) Wiedenhoefer as service engineer under Philip Wallach, district sales manager in the Cleveland office. The announcement comes from R. W. Bayerlein, vice president of Nordberg's Engine Division.

Wooldridge has been with Nordberg since 1956. He has served in various sales, engineering, and production jobs in a specialized training program for this assignment.

Wiedenhoefer joined Nordberg in 1935 and has served the company in several capacities, including New York district service engineer.

Continental-Emsco Co. opens

... a new portable subsurface pump shop at Forsan, Tex., as a "satellite" operation of its Snyder, Tex., store. The shop, which will provide repair services on all types of bottom-hole pumps, is stocked with new D+B pumps and parts.

A. L. Hawkins has been appointed shop foreman and Robert L. Hicks as D+B specialist, according to R. L. Pebworth, district manager at Abilene, Tex.

Atlas Pipe adds M. E. Cassidy

. . . to its sales staff in Corpus Christi, Tex. He has been engaged in oil-equipment-sales activity since the end of World War II. For 12 years Cassidy was with Mid-Continent Supply Co., being in charge of South Texas sales.

W. F. (Bill) Krause, Jr. joins

. . . Macco Oil Tool Co., Inc. as chief petroleum engineer, in which post he will specialize in product application and will conduct specialized training programs for Macco representatives throughout the world. He also will act as liaison between the sales division and the engineering department.

Krause was formerly with Baash-Ross Tool Co. Prior to that he worked for International Petroleum Corp. in Peru.

John W. Anthony joins

. . . Armour Industrial Chemical Co. as a sales representative with headquarters in Dallas. He previously was a consultant with a corrosion engineering firm. Prior to that Anthony worked for Magnolia Petroleum Co., coordinating corrosion-control activities in oil and gas production.

We all insure our valuable equipment against accidental damage or loss. Why not help insure expensive tubing and sucker rod strings against unnecessary wear and service by making a small investment in OIL STATES Rubber Sucker Rod and Tubing Guides?

IT JUST MAKES GOOD BUSINESS SENSE!

Invest a little to protect a lot. **OIL STATES Guides protect your tubing and rods because they:**

- **Prevent metal-to-metal contact between rods and tubing**
- **Centralize tubing in casing, minimizing "breathing" of tubing**
- **Lessen wear on pump by deadening "rod whip"**
- **Prevent paraffin build-up when properly spaced**

OIL STATES RUBBER SNAP-ON GUIDES ARE EASILY INSTALLED AS RODS AND TUBING GO INTO THE WELL. THEY DO NOT OBSTRUCT FISHING TOOLS.

"Oilfield Rubber Products Of Matchless Quality"

See your local OIL STATES Field Representative for additional information or write or call —

Oil States **OIL STATES RUBBER CO.**
P. O. Drawer 152 • Arlington, Texas

OSR-12

Onan makes four promotions

R. E. Mullin W. J. Auger

. . . in its marketing department, announces C. W. Onan, president of the Minneapolis electric-generator manufacturer, a division of Studebaker-Packard Corp.

Roy E. Mullin, former vice president in charge of sales, assumes broader responsibilities as vice president in charge of marketing. William J. (Bill) Auger, sales-promotion manager, has been named assistant general sales manager, reporting directly to Mullin.

G. R. Burda David Onan II

George R. Burda, advertising manager, has been promoted to manager, sales administration. David Onan II, manager of product planning, assumes the title of manager of market planning and promotion.

Republic Supply Co. names

. . . J. E. Gardner and C. W. Heaton as store managers, according to C. J. Jump, general manager of sales. Gardner, whose assignment takes him to Cement, Okla., has served as warehouseman, floorman, and field sales representative during his 5 years with Republic.

Heaton was promoted from field sales representative to store manager in Perryton, Tex. He started with Republic in 1947 as warehouseman in Nocona, Tex. He later served as floorman, special field representative, and field sales representative.

John Maher resigns as prexy

. . . of Reed Roller Bit Co., and Ray O. Shaffer, chairman of the board of directors, temporarily will assume the additional duties of president and chief executive officer. Both Maher and Shaffer became officers of Reed in August 1958. Maher will remain as a board member.

For natural gas pipelines across the country...

Mobil

offers famous products and expert engineering service

From coast to coast and border to border, Mobil serves the specialized needs of natural gas transmission lines.

Wherever your compressor and drying stations may be, Mobil's famous lubricants and technical engineering service are close at hand. Pipelines are turning to Mobil in growing numbers for dependable desiccants as well.

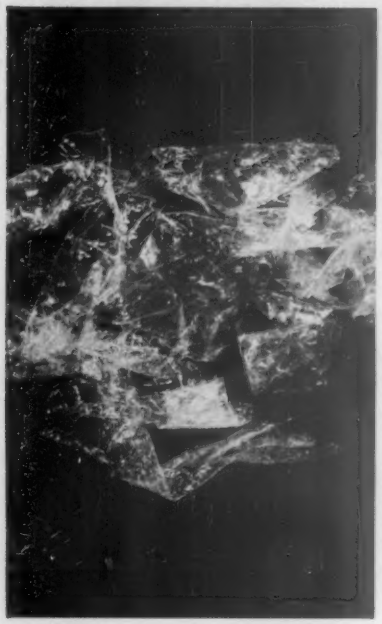
Thirteen Chief Engineers and over 250 Industrial Representatives are constantly on call across the nation to provide you with experienced professional assistance. Check the benefits you can receive from these men—expert engineering service, help in solving special problems, laboratory analysis of lubricating oils, aid in desiccant engineering, technical assistance in setting up liquid hydrocarbon recovery units.

These specialists and the whole Mobil organization stand ready to help you boost efficiency and cut costs. Call us today.

Mobil

MOBIL OIL COMPANY, 150 East 42nd Street, New York 17, N. Y.

THIEF ZONE?



JELFLAKE

Thief zones cost money and time. One of the surest ways to avoid drilling mud and slurry loss to thief zones is to have a supply of Jelflake® on hand. When added to the mud, Jelflake goes to work to plug and plaster—to seal off the thief zones. Jelflake is economical. One 25-pound bag of this plastic foil can cover approximately 500,000 square inches. Get Jelflake before you get in trouble. Available at major mud distributors and all Dowell stations.

Products for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

DIAL DOWELL

A GRAPHIC EXAMPLE of what a tool does is seen in this Teledrift display. The tool, built by Byron Jackson Division of Borg-Warner Corp., measures hole straightness.

Two-story-high exhibit shows hole-deviation tool

AN ADVANCED-TYPE signaling device used in oil-well-drilling operations is the feature of a new two-story-high exhibit recently installed in the Borg-Warner Exhibition Hall in the B-W Building, 200 South Michigan Avenue, Chicago.

The tool is called Teledrift and is used to determine the amount of angle that the hole is drilled from vertical. The signaling device is installed in the oil-well drilling-pipe string and will furnish fast surface reports on whether the hole is drilling straight.

It is not necessary to make a separate run for a straight-hole test nor is there any down time during the drilling operation. Deviation readings can be taken any time during drilling with only a 45 to 60-second pause. Formerly drilling was suspended while special drift-recording instruments were run inside the pipe to the bottom of the hole.

The animated and colorful display was erected for the annual meeting of the API which was held in Chicago November 14-17. A smaller scale floor model was also present so that visitors could operate the tool themselves and learn just how it works.

Teledrift is manufactured by the Byron Jackson Division of Borg-Warner Corp.

"Edward Mudwonder Valves keep our Investment down . . . efficiency up"

Lewis Yates, owner of the Yates Drilling Company, Lafayette, La., has proved to himself through his operating records that Edward Mudwonder valves are saving him real dollars. He says:

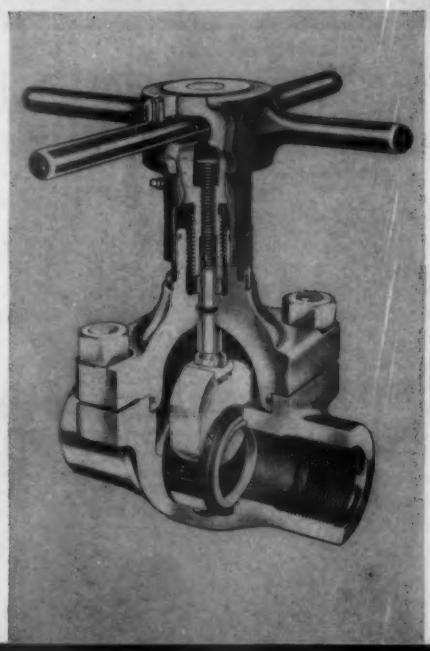
"Actual accounting records on our Rig #1 prove a point I have always believed to be true. The real savings on a mud valve is the money you don't have to spend to keep it in good operating condition. Checking the cost record for Mudwonder mud valves on our #1 rig showed that these valves have required the bare minimum investment in replacement parts. When such is the case, we can give top service to our customers without excessive investment in capital equipment and supplies.

"In short, Mudwonder valves help us keep our costs down due to less maintenance and less repair parts and, naturally, less down time."

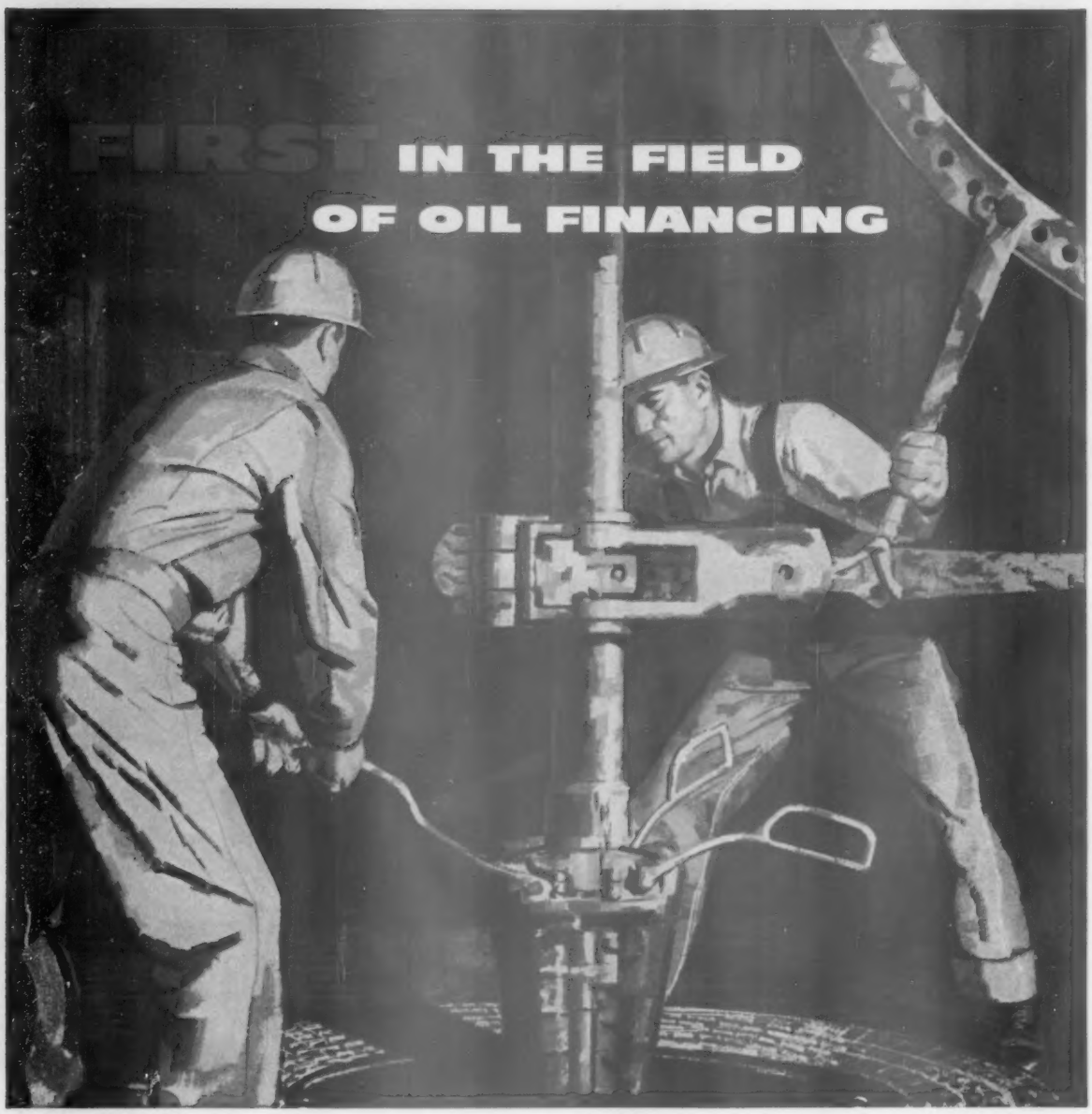
The confidence Lewis Yates has in Mudwonder valves is found wherever you go in the drilling fields. Mudwonder valves are built to 2", 3" and 4" sizes, with screwed or flanged ends, for 2000 psi WP (4000 psi test), 3000 psi WP (6000 psi test) and in 2" size for 5000 psi WP (10,000 psi test) service. See your favorite oil field supply store, or write Edward Valves, Inc., 1212 W. 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company.

EDWARD STEEL VALVES
another fine product by
ROCKWELL

▲ Lewis Yates, owner of the Yates Drilling Company, has found from his own accounting records that Edward Mudwonder valves save him money in maintenance and down time costs.



◀ Mudwonder cut-away view shows the one-piece seat insert with Buna-N molded integrally over steel wear rings; chromed gate with "T" slot connection; separated stainless stem and double thread construction.

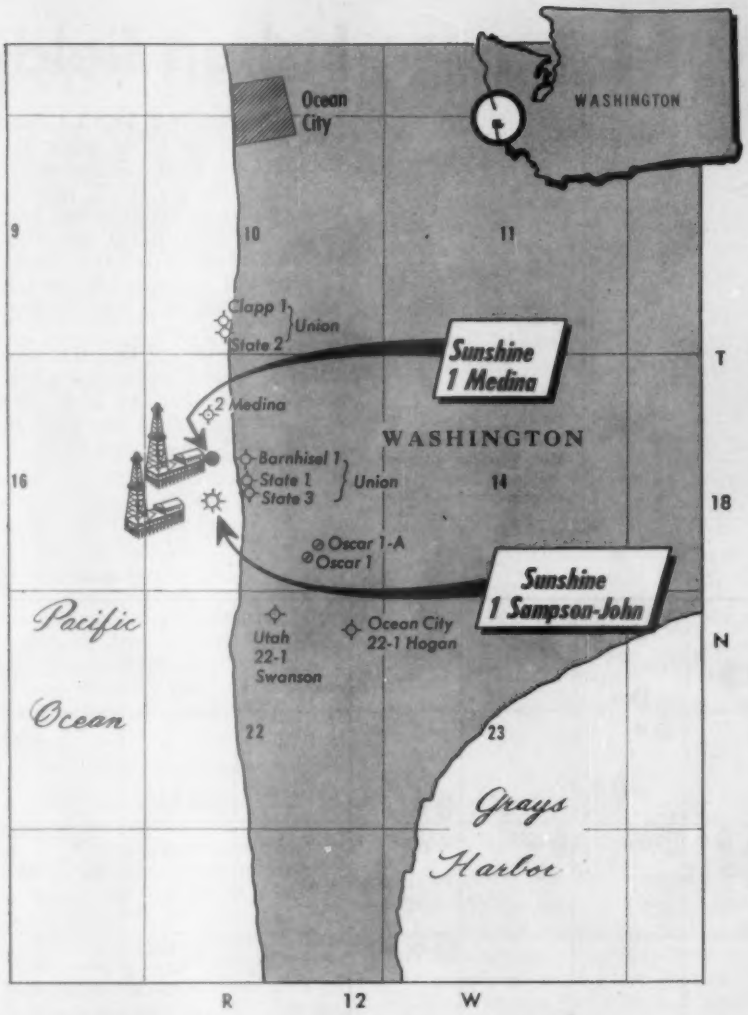


Let your plans include the specialized knowledge and resources of the nation's Pioneer Oil Bank.

85th Year of Dependable Service

FIRST NATIONAL BANK IN DALLAS

Member Federal Deposit Insurance Corporation



THE OIL INDUSTRY of Washington is summed up on this map—one oil well producing 3 to 5 bbl. daily, one gas well producing subcommercial amounts, and two drilling wells. This is Ocean City, the state's only field. It's not much of an industry so far, but Washington operators still hold high hopes for it.

Washington still in oil column—but barely

BY FRANK J. GARDNER

AFTER 3 YEARS of trying, the State of Washington still hasn't made the grade as a real oil and gas producer. The wild enthusiasm that billowed from the Ocean City oil strike in 1957 waned quickly after followup drilling produced only failure.

Success . . . But Sunshine Mining Co., the original discoverer, has kept trying. The 1 Medina, first commercial oiler in the state, was a distinct disappointment after its initial 400-bbl. flow quickly dwindled to an on-again, off-again borderline case. The official potential on the well was 178 bbl. per day in August 1957; since then, the well has produced about 12,000 bbl. of oil. Production declined rapidly following the initial completion and within 6 months it was making only 4 or 5 bbl. daily, its rate today. Production is from the Hoh-Miocene (Blakely) sand at 3,952-58 ft.

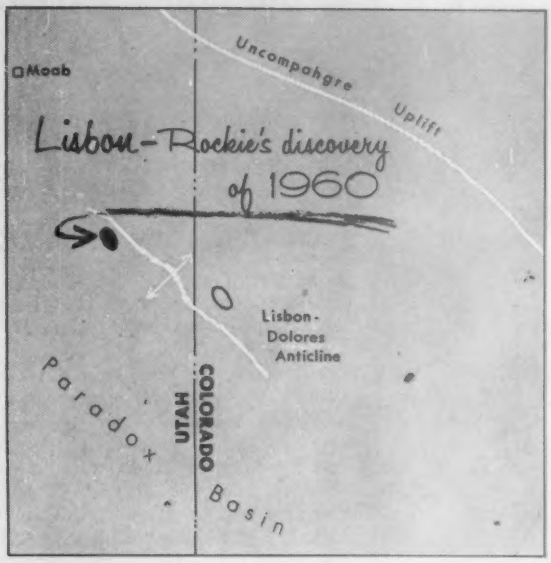
Sunshine's second test, the 2 Medina, north offset to the discovery, was abandoned on December 13, 1958, after reaching 5,125 ft. Then, the company reentered an old dry hole, the Hawksworth 4 State, immediately south of the Medina strike, and in February 1959 made a gas well out of it; this one, renamed the 1 Sampson-John unit, was deepened from 3,711 ft. to 4,522 ft. Final completion was in Blakely sand at 3,601-3,788 ft.; this was not the same reservoir as the one at the discovery. The potential is recorded as 1,600 M.c.f. per day. Sunshine, through its subsidiary, Summit Pipeline Corp., built a 2-mile line connecting the well with a nearby motel and resort.

Today, Sunshine and Cascade Natural Gas Co., et al. have two wells drilling on the Ocean City structure. These are the 1 Oscar and the 1-A Oscar, both less than a mile southeast of the 1 Medina discovery (see map). At last report, the 1 Oscar was "idle" at 5,270 ft., while the 1-A was drilling ahead below 4,300 ft. Both operations are carried on scout reports as tight holes.

And failure . . . Thus the Ocean City prospect continues its pattern of hope versus fact. Ever since 1950, when Union Oil Co. of California drilled its 1 State wildcat, just southeast of the Medina well, drilling has yielded good shows, short flows, and "no goes." The 1 State found good showings of oil at 4,000 ft., but was abandoned when the casing collapsed. Union moved 100 ft. south and drilled the 3 State to 9,344 ft., creating much excitement when small flows of oil came from 3,670-4,440 ft. and 4,663-76 ft. But sloughing shales forced abandonment of the well.

Next ill-fated try was the Hawksworth et al. 4 State, now the 1 Sampson-John unit gas well. In the original drilling in 1951, three high-pressure gas sands were found in the top 126 ft. of the Miocene-Kincaid zone at 3,585 ft. The well actually flowed up to 2,000 M.c.f. gas per day plus an estimated 35-100 bbl. of 47° oil, but it too was finally given up because of mechanical failures.

Depend on interpretation . . . Perhaps the persistence of these Washington operators will eventually solve the riddle of Ocean City. Certainly the structure is there . . . it was outlined by seismic and subsurface work prior to 1950. Certainly the oil and gas are there . . . we've the records to prove that. The missing piece in the puzzle **must** be supplied by interpretation . . . and that's surely up to Sunshine et al.

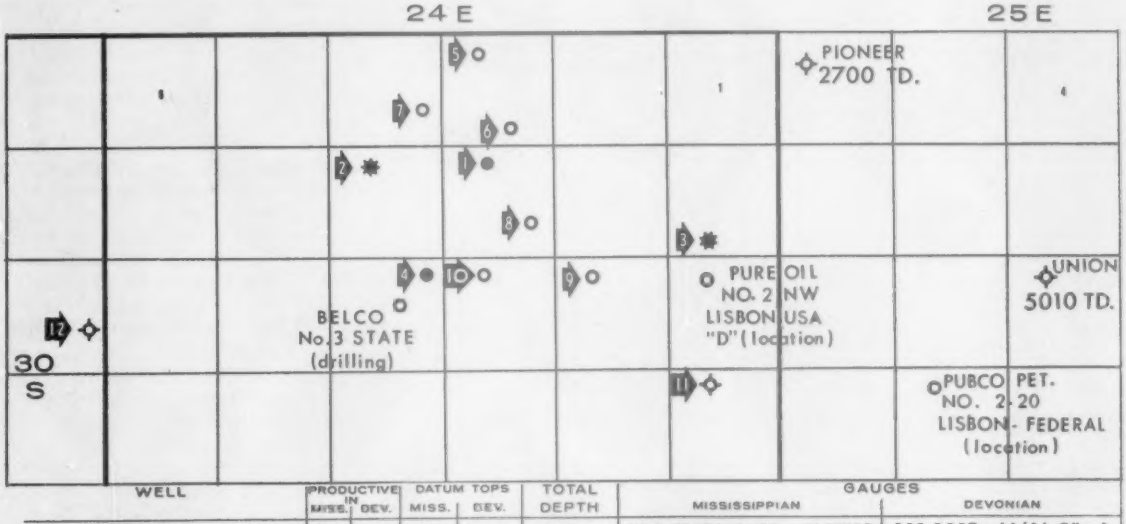


UTAH'S Lisbon field is the first major step in determining the pre-Pennsylvanian potential of Paradox basin.

Lisbon field is

THERE IS LITTLE DOUBT that Lisbon field is one of the major discoveries of the Rocky Mountain region during the past 12 months. Although there are currently only four official completions in the field after more than a year of drilling since the discovery well was spudded, the following significant facts must be kept in mind:

1. The discovery of Devonian production at Lisbon has opened a new province in the Paradox basin, one which had been tested less than 20 times in that basin up until 1950.



	WELL	PRODUCTIVE IN MISS.	PRODUCTIVE IN DEV.	DATUM TOPS MISS.	DATUM TOPS DEV.	TOTAL DEPTH	GAUGES MISSISSIPPIAN	GAUGES DEVONIAN
◗	PURE, 1 NW LISBON, NW NE 10-30S-24E	YES	YES	-949	-1435	8440	NOT PERFORATED, FLOWED 17,500 MCFGPD ON DST	587 BOPD, 14/64 CK, •
◗	ELLIOTT PRODUCTION, #1 LISBON-C, NE NW 9-30S-24E	YES	NO	-2346	-2860	9533	272 BO, 686 MCFGPD, 16/64 CK •	ABANDONED
◗	PUBCO, 1 FEDERAL, SE SW 12-30S-24E	YES	NO	-2067	-2439	9170	1288 BO, 2863 MCFGPD, 43/64 CK •	ABANDONED
◗	BELCO, 2 BELCO STATE, C NE NE 16-30S-24E	YES	NO	-2003	-2484	9120	461 BOPD, 19/64 CK 68 BOPD, 1/2 CK 2 ZONES	ABANDONED
◗	PURE, 2 USA-C, NE NW 3-30S-24E	NO	NO	-3067	-4543	10,706	ABANDONED TESTING SHOWS IN PENNSYLVANIAN SALT	ABANDONED
◗	PURE, 3 NW LISBON-C, SW SE 3-30S-24E	?	YES	-774	-1233	8425	NO CORES OR TESTS REPORTED	REC 6000 FT OF OIL ON DST IN MCKRACKEN, SI
◗	PURE, 1 USA-C, C NE SE 4-30S-24E	YES	NO	-1763	-2257	9133	7200 MCFGPD; 711 BBLS CONDENSATE PER DAY, SI	ABANDONED
◗	PURE, 2 NW LISBON-USA-A, NE SE 10-30S-24E	YES	YES	-1019	-1348	9310	6750 MCFGPD ON DST	198 TO 249 BOPD TSTG.
◗	PURE, 1 USA-B, NE NW 14-30S-24E	YES	YES	-1448	-2153 ?	9022	413 BBLS CONDENSATE, 6200 MCFGPD, 35/64 CK	841 BO, 500 MCFGPD, 36 HRS, 1/2 CK, SI
⇨	STANDARD OF CALIFORNIA 21-15 ARNOLD, NE NW 15-30S-24E	YES	?	?	?	DRILLING	FLOWED 2000 TO 3000 MCFGPD ON DST	NOT TESTED YET
◗	PURE, 1 NW LISBON-D, NE NW 24-30S-24E	NO	NO	-2490	-2919	9648	ABANDONED	ABANDONED
◗	APACHE DRLG, 1 FEDERAL NE SE 13-30S-23E	NO	NO	-2576	-3032	9325	ABANDONED	ABANDONED

• - INDICATES A COMPLETION GAUGE

major Rockies' find for 1960

2. The Paradox basin's Mississippian potential has been demonstrated again, after what may have been waning interest following a series of Mississippian failures immediately after the discovery of Big Flat field in 1957.

3. Production is established on one of five major salt anticlines descending southwesterly from the flank of the Uncompahgre arch, which forms the boundary of the Paradox basin.

These three facts are among the more significant results of Pure Oil's discovery, completed in January of this year. With only four producers actually completed, the caliber field, itself, still is to be proved. Current thinking is that the areal extent of Lisbon field may be indicated by already completed drilling. However, the vertical extent of the pay zones is considered considerably more significant than the areal extent. It will mean, if true, relatively few wells, but long-lived, substantial production from each.

After the Big Flat Mississippian discovery in 1957, exploratory fever ran high in the Northern Paradox basin, soon dying down until the big strike at Lisbon early this year.

History and Geology

Utah's first well was drilled in 1891, and production was first established in 1907 at Mexican Hat. Although wildcats drilled to Devonian and deeper before the Lisbon discovery had found numerous oil stains and shows in the Elbert and McCracken formations, none was commercial. When Pure spudded the Lisbon discovery in August of 1959, the Devonian horizon was still, however, considered a "good prospect."

The discovery of Pennsylvanian production in the southeastern part of the basin by Shell Oil Co. at Desert Creek in 1954 and later by Texaco at Aneth had centered attention almost completely upon formations of Pennsylvanian age.

Then in 1957 exploratory fever was raised with the discovery of Mississippian oil production at Big Flat, and the Paradox basin broke out in a rash of Mississippian tests. None was successful. Many of these Mississippian wildcats were drilled to the west and north of Big Flat, and the Lisbon Valley-Dolores anticline was untouched by the drill in this flurry of drilling.

Less than 20 Devonian tests had been drilled in the Paradox basin, including that portion of it within Colorado, up until 1950. There were no deep tests on the Utah portion of the Lisbon Valley-Dolores anticline before Pure drilled the Lisbon discovery. After 1950, Pennsylvanian objectives were the principal target for wildcatters in the basin, particularly following Shell's and Texaco's successes at Desert Creek and Aneth.

Pure's success at Big Flat in 1957 stimulated Mississippian exploration, but the same company's success late in 1959 at Lisbon has brought a full realization of the Paradox basin pre-Pennsylvanian potential. For example, about a dozen Paradox basin wildcats penetrated to Mississippian or below in 1959, but thus far in 1960 no less than 17 of 33 Paradox basin wildcats have been tests to Mississippian or deeper. Several of these have been scheduled to Precambrian.

This article appeared as a special report in the November 4 issue of Petroleum Information, Denver.

Discovery and Development

Pure Oil spudded the 1 Northwest Lisbon, NE NW 10-30s-24e, San Juan County, Utah, on August 14, 1959. It was completed on January 4, 1960. At that time, one extension had been scheduled. The field lies on the southwest flank and at the northern end of the last (southernmost) of five major salt anticlines southwest of the Uncompahgre uplift.

As of November 1960, there are four officially completed wells in the field. Mississippian and Devonian production is commercially established and some interesting . . . if not commercial . . . shows have been tested in the salt zone of Pennsylvanian.

Pure's discovery was completed flowing 587 bbl. of oil per day through 14/64-in. choke from Devonian perforations 8,261-8,348 ft. Although the well showed for commercial production on drill-stem tests of Mississippian, flowing as much as 17.5 million cubic feet of gas per day, the formation was not tested after crossing was run.

The field's second officially completed producer is located 1 mile directly west of the Pure discovery. It is the Elliott Production 1 Lisbon Valley-C, NE NW 9-30s-24e. Completion was in Mississippian, which flowed 272 bbl. of oil and gas at the rate of 686 M.c.f.d. through 16/64-in. choke. Perforations are from 8,767-8,830 ft. Elliott drilled to total depth of 9,533 ft. in the Aneth zone of Devonian and cored good oil shows in more than 20 ft. of McCracken sandstone. There were no drill-stem tests in other than Mississippian at the Elliott well, however. It is the most westerly production at Lisbon field.

Recent official completions have been made by Pubco Petroleum at 1 Federal, SE SW 12-30s-24e; and Belco Petroleum at 2 Belco-State, C NE NE 16-30s-24e. Both the Pubco and Belco wells are Mississippian producers. Pubco's well flowed 1,288 bbl. of 54°-gravity oil and 2,863 M.c.f.d. of gas from perforations 8,550-8,672 ft. Flow was through 43/64-in. choke. Gas-oil ratio is 2,223:1. The Belco well produces oil from two zones of Mississippian. Final gage from the upper zone, 8,548-8,661 ft., was 461 bbl. of oil per day through 19/64-in. choke and 68 bbl. of oil per day flowed through ½-in. choke from lower zone perforations in Mississippian from 8,697-8,727 ft.

Both Belco and Pubco tested in Devonian. Pubco recovered 620 ft. of salt water on test 9,038-9,162 ft. and Belco recovered fluid that was 5% oil on one of three tests in Devonian.

Pure has been engaged in a vigorous development program to the north, south and southeast of its discovery well. Five Pure wells are in various stages of completion, a sixth location is staked, and one well has been abandoned. Pure's 2 U.S.A.-C, NE NW 3-30s-24e, the field's most northerly location, has been abandoned in Mississippian and Devonian horizons, but has had both oil and gas shows in the Paradox salt section. A drill-stem test 5,844-6,132 ft. in the salt zone flowed 299 bbl. of oil in 5¼ hours through ½-in. choke, together with gas at a maximum rate of 940 M.c.f.d. Subsequent tests of perfora-

tions in this zone, however, have not been encouraging.

A northeast extension to the Devonian discovery, Pure's 3 Northwest Lisbon-C, SW SE 3-30s-24e, is shut in. Best show here was 6,000 ft. of oil reversed out on drill-stem test 8,291-8,425 ft. in McCracken. No gages have been reported from a sand-fractured and acidized open hole zone, except for a flow of 80 bbl. of load oil in 24 hours through 32/64-in. choke. Pure has reported no cores or tests in Mississippian at this well, but the horizon is believed to be productive.

Northwest of the Devonian discovery, Pure is shut in at 1 U.S.A.-C, C NE SE 4-30s-24e. A 24-hour test of Mississippian flowed gas at the rate of 7,200 M.c.f.d. and recovered 711 bbl. of condensate. Some shows were cored in Devonian, but drill-stem tests had only slight shows.

McCracken (Devonian) production apparently is established also at a southeast extension to the Devonian discovery where Pure's 2 Northwest Lisbon-U.S.A.-A flowed at rates ranging from 198 to 249 bbl. of oil per day from perforations between 8,254-82 ft. Tests continue at this well. On drill-stem test of Mississippian gas flowed in apparently commercial volume.

Also shut in is Pure's 1 U.S.A.-B, NE NW 14-30s-24e, 1½ miles southeast of the Devonian discovery. It flowed 841 bbl. of oil and gas at the rate of 500 M.c.f.d. on a 36-hour test through ½-in. choke of McCracken perforations 8,905-43 and 8,960-98 ft. Mississippian also is apparently productive in this well, and has flowed as much as 413 bbl. of condensate and 6,200 M.c.f.d. of gas through 35/64-in. choke from perforations 8,192-8,548 ft.

The most recent apparent success in Lisbon field is by Standard Oil of California 1 mile directly south of the Devonian discovery and ½ mile east of Belco Petroleum's success. Standard recovered gas on two drill-stem tests in what is believed to be Mississippian. Test 8,222-8,370 ft. flowed 3,300 M.c.f.d. and reversed out 3 bbl. of condensate and mud. Rate of flow on test 8,129-8,223 ft. was 2,100 M.c.f.d. and a small amount of condensate. Standard will drill to McCracken.

At the beginning of November, production of commercial calibre extended along a 3-mile northwest-to-southeast axis from NE SE 4 to SE SW 6-30s-24e. A similar distance separates production at Belco's well in NE NE 16 and Pubco Petroleum's producer in SW SE 12. Still not spudded are locations by Pure in NE NW 13-30s-24e and by Pubco in NE NW 20-30s-25e.

Three significant wells have been abandoned in the general area since completion of the discovery well. Pure's 2 Northwest Lisbon-C, NW NE 24-30s-24e, recovered only very slight shows in both Mississippian and Devonian. Apache Drilling's failure in NE SE 13-30s-23e had no significant shows and a 10,636-ft. dry hole in NE NE 32-29½s-24e by Belco had no substantial shows in any horizon. Shallower failures to the east of the field were drilled many years before the discovery, but neither penetrated Mississippian or Devonian horizons.

A current assessment of Lisbon field indicates that it assuredly stands as a major Rocky Mountain region find. Current evaluation also shows that the Mississippian, rather than Devonian . . . at this stage of development . . . offers the best potential. All producers in the field have either been completed in or have indicated for commercial production in Mississippian. Also, log and sample analyses support the conclusion that the Mississippian limestone offers reservoir characteristics superior to those in the McCracken sandstone of Devonian age, at least in Lisbon field. Actual reserve figures for oil or gas in either Devonian or Mississippian have not been made available.

Outlet for Production

Lisbon field is relatively well situated for outlet. Although currently gas production is shut in, the main trunk of the Pacific Northwest Pipeline passes through the southwestern corner of Township 30s-24e, in which the field is located.

Oil production currently is being trucked southward where it enters the Texas-New Mexico pipeline which originates in Aneth field area of southeastern San Juan County. About 60 miles separate Lisbon from the beginning points of both the Texas-New Mexico and the Four Corners pipelines. These currently serve Aneth and other fields in this part of the Paradox basin.

Land Picture

Lisbon field area is made up exclusively of government land. Pure's activity has been conducted on federal leases lying along what is currently indicated to be the major producing part of the trend.

The other two principal acreage holders in the immediate vicinity of the field are Pubco Petroleum and Belco Petroleum. Pubco's leases lie in Township 30s-25e, with the exception of almost a full section on which is located the firm's producing well in the field.

Belco's holdings were purchased from a pooling of acreage formerly held by Jupiter Oils, Entrada Oil & Gas, and Resource Ventures. This acreage consists of three full sections in 30s-24e, on one of which Belco has completed one producer and is drilling at another location, together with Sections 7 and 18-30s-24e. Other acreage in the Belco block lies principally to the northwest of currently established production, with scattered blocks lying also to the north and northeast.

Illinois basin grows in three states

ILLINOIS BASIN developments included discoveries in all three states, Indiana, Kentucky, and Illinois.

In Indiana, 6 miles southwest of Mount Vernon in Posey County, Dr. Nobert Welch et al. 1 Rosa Lawrence, NE SE SW 5-8s-14w, flowed 1,172 bbl. of oil through casing from Aux Vases sand at 2,670-88 ft. the first 24 hours. The 2 Rosa Lawrence in NW SE SE 5, one location east, swabbed 14 bbl. per hour, natural, from 2,649-67 ft.

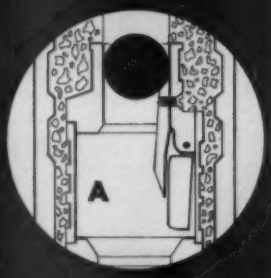
In Kentucky's Ohio County near Magan in 17-N-32, Carl Helm is drilling at 760 ft. at the 1 Moore-Hardesty. The well tested 8 bbl. per day, natural, from the Tar Springs sand at 663-75, 687-98 ft.

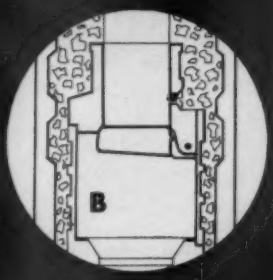
In Wayne County, Illinois, Peake Petroleum Co. is developing a new Warsaw area with good success. The 1 Fethers et al. 4 miles east of Wayne City in C SE NW 14-2s-6e, opened the area in September pumping 175 bbl. per day at 4,148-62 ft. The second well in the field, 1 Brown in C NE SW 14, flowed 125 bbl. per day last week from 4,152-59 ft. The 1 Ralston in C NW SW, seventh well in the section by Peake, is at 3,439 ft.

- In Jefferson County 5 miles north of Mount Vernon, Burrell G. Minor 1 Edna Johnson in SW SW SE 28-1s-3e, swabbed 8 bbl. of oil per hour after acid treatment in the Rosiclare at 2,698-2,704 ft and the McClosky at 2,704-9 ft. This is a ½-mile stepout discovery.

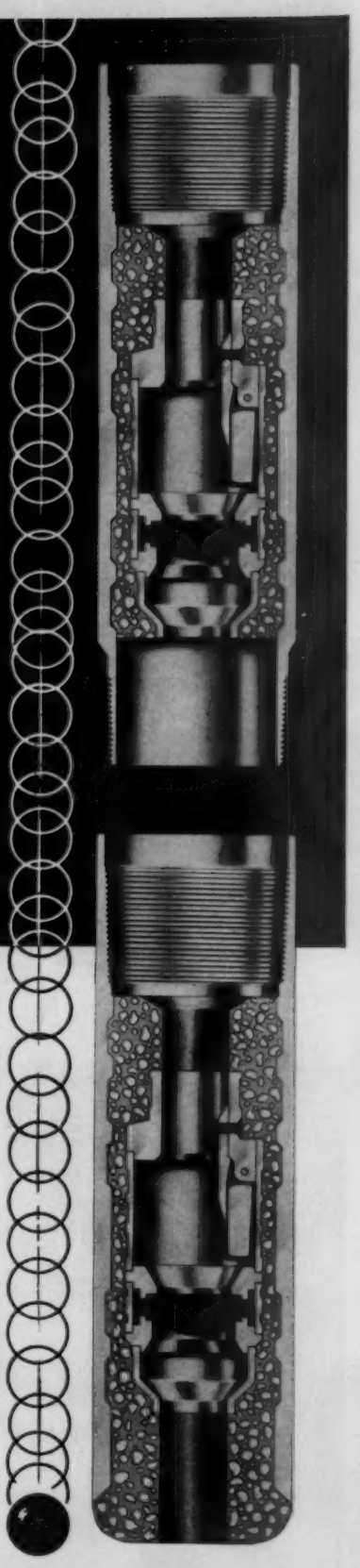
- In Sangamon County, 1 mile southwest of Rochester and one location north of a small Silurian oil well, Morgan & Wilkening Oil Co. 1 Herndon et al. in SE NE SW 29-15n-4w, is pumping 50 bbl. of oil per day from the Devonian sand at 1,625-28 ft. and the Silurian at 1,628-34 ft.

NON-STOP TO BOTTOM





LARKIN CIRCULATING FILRITE CEMENTING EQUIPMENT



For automatically filling the casing from the bottom while casing is being run.

For allowing downward circulation through the casing at any time during the casing run.

Larkin Circulating Filrite Cementing Equipment makes possible a non-stop casing run without pressure surges but still permits full downward circulation when necessary.

The resilient diaphragm valve permits a continuous but restricted bottom-fill which is sufficient to maintain adequate casing fill without over-flow.

The flapper type valve is maintained in open position by an aluminum retaining bar which is held in place with a shear screw. The flapper valve is released by dropping a ball which shears the screw as it passes through the valve mechanism.

The flapper valve is spring loaded and provides a POSITIVE BACK PRESSURE SEAL WHICH HAS NO DEPTH LIMITATIONS.

LARKIN
...Through Your Supply Store

Circle A: A view showing dropped ball in shearing position.

Circle B: A view showing flapper valve in closed position after being released.

LARKIN PACKER COMPANY

DIVISION KOEHRING COMPANY
WAXAHACHIE, TEXAS

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

HAVING MOVED ACROSS A SWAMPLAND CANAL on a barge, the pullboat prepares to haul seismic equipment into the swamp wasteland near Bayou Sale. The boat is 21 ft. long, and weighs 2½ tons loaded.
(Photos and information courtesy The Humble Way)

Mud cruiser moves explorationists over Louisiana swamplands

SEISMIC EXPLORATION in the swamplands of South Louisiana calls for unusual types of equipment and ingenuity. Humble Oil & Refining Co.'s seismic parties use a mud cruiser known as the "pullboat."

This unusual swamp craft is pulled through the soggy swamplands by looping one end of a cable around giant trees. A man in the boat then starts the winch which pulls the craft through underbrush, water, bogs, and vines.

This new equipment is a vast improvement over the old "carry it yourself" method. The pullboat can go where no marsh buggy would budge and into areas where helicopters are of no use. Humble has nine of these pullboats in use. The company has had them in service for about 2 years. The boats work in teams. With one boat crewmen drill shot holes along a line laid out by engineers. Then a second boat carrying seismic instruments moves up, strings out geophones, sets off the charge, and makes the recordings.

These pullboats enable a swamp seismic party to complete three shots a day, sometimes four. In easier ter-

CREW LOADS HOLE in "heavy water" with 10 lb. of explosives.

WIREMAN Roy Thibodeaux carefully moves through the swamps, unreeling the line for burying geophones.

THIS SMALL RIG is mounted on the stern of the pullboat. It drills a 60-ft. hole—three at each shot position. Crew member in foreground builds a water filter trap for drilling water.

THE PULLBOAT is the answer to transportation problems in densely clogged swamplands of lower Louisiana.

rain the pullboat can move at 5 miles per hour. Other times it may take half a day to go 1,200 ft.

Humble Party 21, shown in the accompanying photos, works a 10-day stretch and then 4 days off. Roy Easley is party chief. Party 21 has worked in open Gulf of Mexico waters, in Louisiana swamps, and in cane fields.

CREWMAN Elwood Stephens, left, sets off the charge while Roger Moreland operates seismic equipment.

CHOOSE FROM A COMPLETE LINE . . . Another reason why you get more value with Guiberson

It's swab performance that counts!

Quick-Change, Knuckle-Joint Swab
Change cups without tools in ten seconds. Type UF or Multiwing Cups float on mandrel and serve also as valves. Knuckle action permits easy running of multi-cup units by adding mandrels and cups as desired. Only three metal parts.

Type UF Swab
. . . a threaded joint swab otherwise similar to knuckle-joint swab in 2" - 3½" sizes. Slightly different design in 1", 1¼", 1½" and 1¾" sizes. Use with Type UF and Multiwing Cups.

Types UF and Undersize UF Cups Flexible all-purpose cups with heavy wall and extra length for lifting heavy loads . . . light loads, too, from great depths. Serve as valves on swabs shown. Sizes from 1" through 3½", also undersize cups for swabbing restricted tubing.

Multiwing Cups
Especially effective in fluid containing high ratio of sand. Eight upturned lips integrally molded with built-in relief features provide maximum clearance for fast falling. Pass easily through tight spots and automatically dump excess. Sizes from 1" through 3".

Guiberson cups and swabs are the result of the best engineering and field-proved experience, plus the finest, most complete product production facilities in the world.

Yes, you can count on Guiberson quality . . . and because the Guiberson line is a complete line, you can get the swab and cup you need to do any job better. The swabs and cups shown here are just a part of the nine types of cups and suitable swabs from 1" through 13".

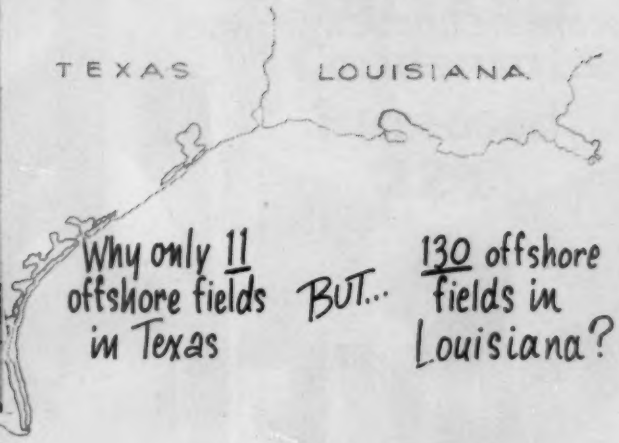
You can count on your Guiberson representative to recommend the cup and swab combination best suited to your particular needs.

Sold by Oil Field Supply Stores Everywhere

THE GUIBERSON CORPORATION
DALLAS, TEXAS, U. S. A.

PRODUCTION, DRILLING AND WORKOVER SPECIALTIES, MOLDED RUBBER PRODUCTS

DRESSER INDUSTRIES INC.
OIL • GAS • ELECTRONICS
CHEMICAL • INDUSTRIAL



Texas drillers are beginning to concentrate more attention on

exploring offshore possibilities

THERE IS an inkling of increased exploratory activity off the coast of Texas. Four wildcats currently busy in the Gulf of Mexico off Galveston and Jefferson counties mark the greatest array of exploration in these waters in several years.

TEXANS LOOK TO THE GULF . . . as Continental Oil Co., Shell Oil Co., and Kirby Petroleum Co. try to answer the question, "Why are there only eleven offshore Texas fields."

Continental has location for an 8,000-ft. wildcat 31 miles southeast of Freeport in Block 349. The 1 OCS-0719 will be drilled in water 75 ft. deep. Mr. Gus II mobile drilling barge will be used on the wildcat, which is the first to be drilled by Continental on acreage bought at the federal offshore-lease sale earlier this year. There is no nearby production.

Shell Oil Co. went to 16,091 ft. before quitting at Federal Block OCS-288, 31 miles south of Galveston. Continental Oil Co. will drill a rank wildcat off Galveston County at 1 OCS 0783, Block A-40, 47 miles southeast of Freeport.

Shell's other offshore attempt is 1 Federal Block 236, OCS Tract 0746, a 13,000-ft. wildcat to be drilled 25 miles southeast of Galveston. Nearest production is about 12 miles northwest at GAB 189 field.

Kirby Petroleum Co. drilled to 6,940 ft. at 1 State Tract 11, off Jefferson County, 8 miles west of Sabine Pass. Nearest production is about 2 miles to the southeast at Hunt Oil Co. No. 1 in Tract 20.

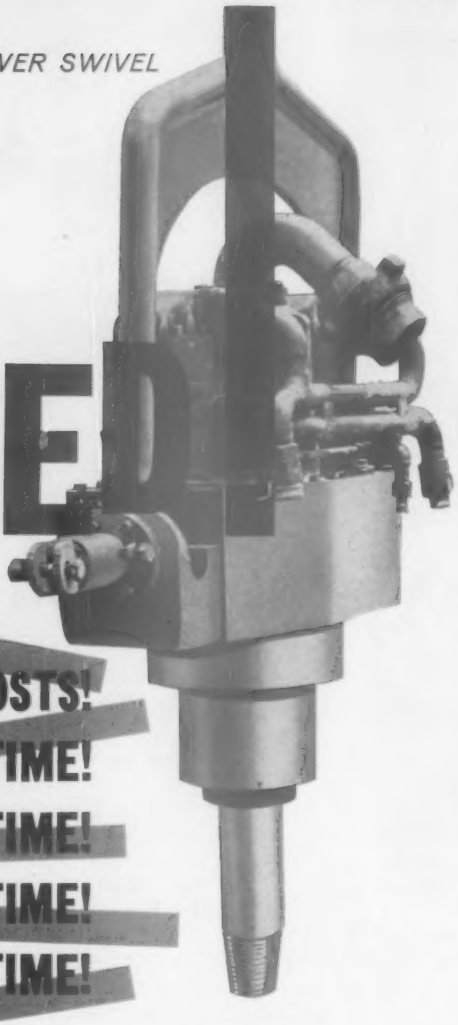
An 11,000-ft. wildcat was announced by Texaco to be drilled 3 miles south of Sabine in the Gulf of Mexico off Jefferson County. The 1 State Tract 2-S is to go down about 1 mile south of Sabine field.

A LONG HAUL SINCE McFADDIN BEACH . . . has netted only 11 offshore Texas fields. British American Oil Producing Co. drilled four wells at McFaddin Beach back in 1941-42. One of those had oil, but it wasn't until 1956 that commercial production was established here by Stanolind Oil & Gas Co. Texas offshore producing areas stretch from Offshore Kleberg County at Sprint northeastward to Hunt Oil Co.'s Block 20-S field off Sabine Pass. Sprint has 1 gas well, Chevron produces gas and oil, GOM St. 904 produces gas-condensate, Mustang Island Block 889 has gas-condensate, GAB 189 oil and gas, GOM FT-144-L gas-condensate, Block 140-L gas, McFaddin Beach oil and gas, Block 52-L oil, High Island Block 10-L gas-condensate, and Block 20 with one oil well. In addition to the strictly offshore fields in Texas there are four areas that are offshore extensions of onshore fields. These fields are Kain gas, South Sargent gas, Caplen oil, and High Island oil.

THE NOT-SO FORTUNATE TEXANS . . . look with envy to the 130 offshore fields of Louisiana. Texas offshore exploration hasn't fared as well because of many things. There is a different geologic problem off the Texas shore. There are thick sands and shales but no alternation of the two in proper trapping mechanism. The updip sand phases of the Frio begin to play out in the offshore areas. This leaves the thick Miocene section of Louisiana fame far out into the Gulf. They haven't discovered enough of the suspected salt domes off the Texas Coast. One popular theory among offshore-thinking Texans is that there might be a possible line of play following a similar pattern such as along the paralleling Balcones fault zone, Mirando shoreline, and Vicksburg flexure. Lots of expensive, extensive, and deep-water exploration, and possibly many dry holes must follow before they know what it's all about off the Texas Coast.

—John C. McCaslin

SCOTT-HYCALOG POWER SWIVEL



SAVE!

75% USUAL COSTS!
80% USUAL TIME!
5 DAYS RIG TIME!
30% USUAL TIME!
65% USUAL TIME!

HYCALOG

Taken from actual records of drilling, coring and workover, these are but a few cases off the stack. The SCOTT-HYCALOG swivel eliminates the expense of rotary, Kelly and conventional swivel. Quick to rig up . . . Quick to move . . . it can be operated in any derrick or mast of any type which will support weight of the drilling string or tubing. *Let this swivel save money for you!*

HYCALOG, INC.

505 AERO DRIVE, SHREVEPORT, LOUISIANA.

OFFICES IN PRINCIPAL OIL PRODUCING AREAS

DIAMOND BITS • CORE BARRELS • WELL LOGGING • DIAMOND CORING • CORE ANALYSIS • POWER SWIVELS

Nebraska exploratory well completed in Kaneb basin

In the Kaneb basin Sunray Mid-Continent Oil Co. has completed an exploratory well in Dundy County, Nebraska, which is about 24 miles northwest of proved Pennsylvanian production in Cahoj field of Rawlins County, Kansas.

About 7 miles north of Benkelman, Neb., the 1 Ralph E. Stroup, C NE SE 8-2n-37w, pumped 203 bbl. of 31°-gravity oil a day from perforated intervals at 4,138-48 ft. and 4,272-4,309 ft. in the Lansing-Kansas City lime. The hole was drilled to 4,150 ft. with 5½-in. casing cemented at 4,500 ft.

Drilled on a Sunray wholly owned 480-acre block, the discovery well is located on a seismic anomaly on the southwest limb of the Cambridge arch in the northern end of the Hugoton embayment.

Sunray holds approximately 2,700 acres within a 2-mile radius of the discovery well and is currently drilling the 2 Stroup as a south offset.

Texas deep-pay field stretches eastward

The new deep production opened early this year on the west side of the old relatively shallow Saxet field west of Corpus Christi is being extended a mile eastward in a significant test drilled by Champlin Oil & Refining Co.

Champlin's well, 1-C Weil, located just northeast of Clarkwood, has an open-flow rating of 3,200 M.c.f.d. of wet gas and is shut in with pressure of 4,311 psi. Flowing pressures ranged from 1,610 psi. through 5/16-in. choke to 3,339 psi. through 9/64-in. choke. Its pay is perforated at 9,545-62 ft.

This is the third well for the new deep production. First was Atlantic Refining Co. 37 Rand Morgan, rated good for 20,400 M.c.f.d. of gas with perforations at 9,500-10 ft., 9,520-30 ft., and 9,538-51 ft. It had a gas-liquid (51.3°-gravity condensate) ratio of 26 M.c.f. per bbl.

Golden Falcon Oil & Gas Co. offset this well with its 1 Donigan, completed for an open-flow potential of 45,500 M.c.f.d. of gas with a ratio of 27,400 cu. ft. per bbl.

A test drilled by Renwar Oil Corp. south of these wells failed to get commercial production.

Dillard & Waltermire Drilling Co. is putting down the area's fourth test, located 1,300 ft. northeast of the Golden Falcon producer.

PENNSYLVANIA SHALLOW-WELL COMPLETIONS, THIRD QUARTER OF 1960

County—	Total	Oil	Gas	Dry	Input	Footage
Armstrong	14	0	13	1	0	42,108
Butler	1	0	1	0	0	1,802
Clarion	5	1	4	0	0	11,099
Fayette	1	0	0	1	0	3,952
Forest	4	0	3	1	0	8,665
Greene	2	0	0	2	0	1,118
Indiana	10	0	9	1	0	35,025
Jefferson	5	1	3	1	0	12,793
McKean	130	76	0	0	54	238,879
Venango	7	5	0	2	0	6,549
Warren	6	3	0	0	3	3,933
Washington	3	2	0	1	0	6,409
Westmoreland	14	0	11	3	0	49,027
Total	202	88	44	13	57	421,359
DD	7	2	1	3	1	2,721

Alberta's Caribou Mountain area to see drilling action

CARIBOU Mountain region—the northwesternmost spread of petroleum and natural-gas rights held under exploration permit in Alberta—will come under the highly critical eye of the exploration geologist during the next few months as this particular area's most active exploration play ever will be under way come freezeup.

Major role in the new search for petroleum and natural-gas reserves will be carried out by Pan American Petroleum Corp. This large American firm has already announced plans for 12 to 14 wildcat tests for the winter drilling season. Other companies have also indicated plans for wildcats but no definite drilling projects by these other firms have been announced.

Pan Am's interest at Caribou Mountain can be gaged by the fact that it currently holds three million acres under reservation. Just over one million of that total was acquired in the past year. In fact, a 17 by 17-township block, bordered on the east by the fifth meridian, on the north by the Northwest Territories, on the south by the northern border of Township 109, and on the west by Range 17w5—a total of 6,658,650 acres almost half is held by this firm.

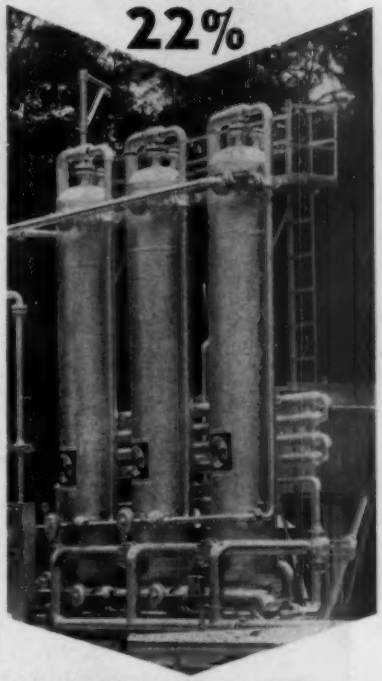
It is also significant that Pan Am, on its own, plans as many wells on the Caribou Mountain project as were drilled in the entire area of Alberta lying north of Township 91 during the drilling season of 1958-59. The size of Pan Am's wildcatting project is even more significant when it is taken into account that the exploration area referred to covers 19 million acres. This same northern region of Alberta had two dozen holes drilled in the search for oil and gas in 1959-60.

Hay River. Pan American's recently reported project is being carried out in the northeast corner of the Hay River basin—that area of Alberta lying north of Township 91 and within the region of sedimentary basin. Although there have been no indications of commercial oil or gas production in this region as yet, a number of promising gas shows have been recorded as well as a very interesting free oil recovery. Main interest is centered on the oil and gas prospects of the Middle-Devonian age.

Two tests staked. Two of the tests in this extensive drilling program have already been staked by Pan American for early drilling. Contracts have not yet been awarded but early starts are anticipated. Both of the new tests are to be drilled to about 3,000 ft. as tests of the Muskeg formation. The most southerly of the two locations Pan American A-2 Bushe River 10-29-111-15, on LSD 10, 29-111-15w5, is situated in the southwest sector of the huge acreage spread held by the firm, and is close to a previous test that gave a free-oil recovery from the Middle Devonian. The second location meanwhile, Pan American A-2 Caribou 6-24-117-11, on LSD 6, 24-117-11w5, is near the center of the land block 40 miles northeast of the Bushe River prospect.

Another brief look at the land picture reveals that in addition to the three million acres held by Pan American a group headed by Dynamic Petroleum Producers, Ltd., holds over 1.4 million acres immediately east of the Pan Am. block, while Union Oil Co. of California, Charter Oil Co., Ltd., Home Oil Co., Ltd., and other Canadian independents hold limited acreage tracts in the immediate vicinity. It is understood that in addition to lands filed on by Pan American it is also negotiating farmout deals with other land holders.

SALEABLE Condensate Increased 22%



With the New HY-SORB

In the Alco-Mag field near Houston, an operator has installed one of Maloney-Crawford's new three-tower Hy-Sorb quick-cycle recovery units downstream from cold separation. The low temperature separation units are producing a total average of 21.5 Bbls/MMS CF/gas and the Hy-Sorb is increasing stock tank liquids 22 per cent by producing another 4.83 Bbls/MM from the tail gas. The gas volume throughput averages 5.5 MMS CFD/D at 850 pounds pressure. This is a typical field report on Hy-Sorb performance . . . performance that means quick payout. The dry-bed HySorb gives greater efficiency because each of the three towers does only one job at a time. Maintenance and operating costs are low because there are no hot pumps, motors, seals, bearings, etc. Flow is controlled by a single selector. Write for full details.

MALONEY-CRAWFORD
TANK & MANUFACTURING CO.
P. O. Box 659 Tulsa, Okla.

Another Step In Gray Quality Control . . .

ENGINEERING DESIGN

From drawing board to well head installation, good, basic engineering design is built into every Gray Well Head Control Assembly component. Gray's Engineering standards require practical application of such engineering precepts as more strength, less weight; reduction of areas subject to pressure; elimination of unnecessary parts. Gray has done this, and combined it with flexibility to efficiently handle every well control problem in whatever pay zone you are working — deep or shallow, single or multiple.

For additional information about why Gray Engineering Design is another step forward in advanced quality control, write today for your copy of the new Gray Catalog.

GRAY *Tool Company*

6001 P. O. BOX 2291 HOUSTON 1, TEXAS Riverside 7-1240

B.C.'s Bubbles area moves 4 miles

AN IMPORTANT natural-gas success in the general Jedney-Bubbles district of northeastern British Columbia highlighted exploration activity in western Canada the past week. While the strike is not an exploratory test it is considered to be highly important as it found a buildup of zone in the top of the Triassic and extended the field almost 4 miles to the northwest.

The driller, operated by Pacific Petroleums Ltd., but being drilled by a team which includes: Pacific; Pan American Petroleum Corp.; Dome Petroleums, Ltd.; Sunray Oil Co.; Imperial Oil Ltd.; Canadian Northern Oil & Gas, Ltd.; Charter Oil Company Ltd., and Medallion Petroleums, Ltd.; will now be carried on down to test lower objectives.

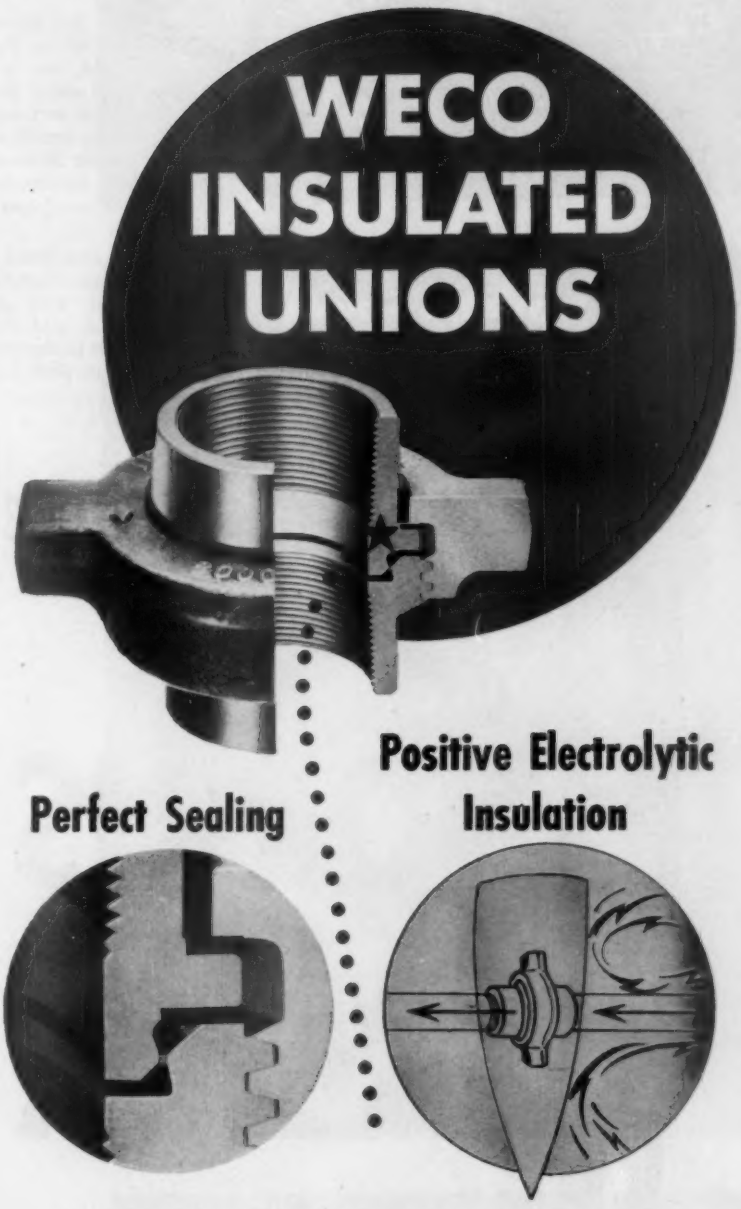
The new find is 3½ miles northwest of previous production in the district, but that well found only a small amount of porosity in the zone from which the new well is productive. Farther southeast, a comparable amount of porosity was found in the zone and it constitutes a major part of the Jedney field proper.

Jedney. This new strike, Pacific et al. d-97-C-94-G-8 Jedney, is 3½ miles north of the Pacific Imperial 42-C Jedney Triassic 'D' gas success.

A drill-stem test in the Baldonnel (Triassic A) horizon of a 38-ft. interval below 4,740 ft. gave gas a maximum rate 3,880 M.c.f.d. Flow levelled at 3,629 M.c.f.d. and then remained constant until end of test. Flowing pressure—an indication of reservoir characteristics—was building at the conclusion of the test.

Deep test. In this region of northeastern British Columbia most of the wells to date have only been taken to the Triassic horizon. This new strike, will be taken to the Mississippian. For the undertaking, companies with land interests in the area formed a pooling agreement on certain of their rights. On one side of the agreement, Dome and Pan American put up a small amount of land as did the Pacific et al. group. As both firms hold other substantial holdings in the vicinity the well will go far in proving or disproving both team's rights.

While the well is being carried on down to lower objectives casing will now be placed in the hole to prevent sealing of the formation and conversion to mud drilling. As the well has been drilled with gas, conversion to mud drilling would be fairly expensive and at this time unwarranted. In



Now, stop electrolytic action on pipes and fittings with new WECO Fig. 211 Insulated Unions. Special locked-on, laminated insulating rings provide more than 35 million ohms resistance across the union. Full circle contact seating of an "O" ring seal ring provides perfect sealing at pressures up to 2000 psi and at temperatures up to 350° F.

Stocked by supply stores everywhere . . . ready to give you perfect electrolysis control wherever unions are used. Sizes 1" through 4".

WECO WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS
Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

C-1-60

fmc

anticipation of the Triassic gas a larger-than-normal diameter surface casing was set in the well (13⅜) and while 9⅝-in. was run earlier to the base of the Gething horizon, the 7-in. string about to be placed through the Triassic will still allow enough room for at least one other casing inside it.

Rockton most active Pennsylvania area

THE MOST active area in Pennsylvania is the Rockton field, Clearfield County. Five wells are drilling in a fault block known as the Helvetia pool. This pool is part of the Punxsutawney-Driftwood field, and is located at the southwestern end of Rockton pool. Just north of this area across the axis of the Caledonia syncline on the southeast flank of the Sabinsville anticline, development continues in Boone Mountain pool southwest of Dubois.

Two producers were completed last month in the Onondaga chert-Oriskany sandstone section with open flows of 11,600 M.c.f.d. and 5,300 M.c.f.d. A 5-mile stepout to the southwest of Boone Mountain pool found the Oriskany sand present in a faulted section. The well, J. Bobal, by Sam Jack et al., was dry.

Somerset County. Boswell field had one completion during the month. The well produced 300 M.c.f.d. after fracturing the Onondaga chert-Oriskany sandstone section.

Outpost. An outpost from a recent discovery on the Laurel Hill anticline in Westmoreland County found 4,100 M.c.f.d. and a little salt water.

Ole Bull. The field well in Ole Bull pool in Leidy field, drilled by Phillips Petroleum Co., was completed as a gasser for 4,800 M.c.f.d. at a rock pressure of 3,900 psi. in 12 hours in the Oriskany sand. This well is being offset by the company.

Ohiopyle field. Manufacturers Light & Heat Co. had two dry holes in their Ohiopyle field, Fayette and Somerset counties, on the Laurel Hill anticline.

One well drilled through a faulted zone while the other found the Oriskany but no gas. About 6 miles to the southwest of the most southerly well in Ohiopyle field, Manufacturers is drilling a wildcat just north of the West Virginia border in search of the Onondaga chert - Oriskany sandstone interval. The well is drilling at 3,385 ft.

Tioga County. Two wildcats were dry in this county, looking for Oriskany sand.

Bedford County. A wildcat in Bedford County, New York State Natural Gas Co.'s Morris well, drilled just west of the Purcell field area, was dry.

Some interesting wildcats have just been announced for the state. Phillips Petroleum Co. has just staked a wildcat in Greenfield Township, Blair County, on a Pennsylvania State Tract. The nearest wildcat is a dry hole 13 miles to the northeast. Nearest production is 22 miles to the west on the Laurel Hill anticline.

Gulf Oil Corp. and John Galey et al. have announced a wildcat on the Amity anticline in Washington County. The well will test the Oriskany-Helderberg section.

In Cambria County on the Laurel Hill anticline, a wildcat is to be drilled by Charles Grabiak on the Piney Run Mining Co. property in Lower Yoder Township.

Legislation. Operators in Pennsylvania have just reviewed the proposed conservation measure as drafted by a committee from the oil and gas industry.

After spending 2 days reviewing the draft, a number of changes were suggested and the draft returned to the committee to incorporate the changes. Later, the entire draft will be reviewed again before submitting to the legislature bodies of Pennsylvania.

Champions of Endurance!

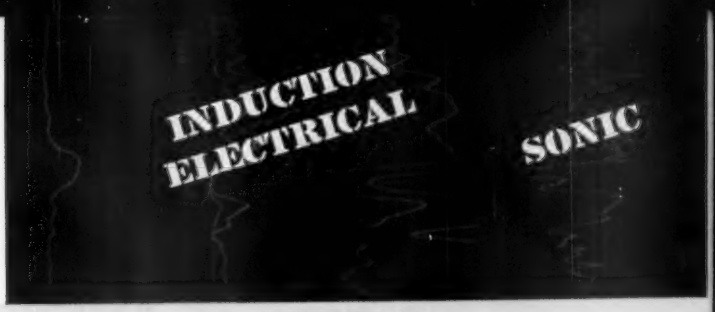
W.C. NORRIS SUCKER RODS

Write for complete Sucker Rod Bulletin

W. C. NORRIS, MANUFACTURER
DIVISION OF DOVER CORPORATION
P. O. BOX 1739 • TULSA, OKLAHOMA
BRANCHES: Great Bend, Kansas; Corpus Christi, Houston, Kilgore, Odessa, Wichita Falls, Texas; Oklahoma City, Oklahoma; Salem, Illinois; Casper, Wyoming; Farmington, New Mexico; Edmonton, Alberta, Canada.

NORRIS QUALITY
SUCKER RODS
POLISHED RODS - COUPLINGS

Buy From Your NORRIS Distributor



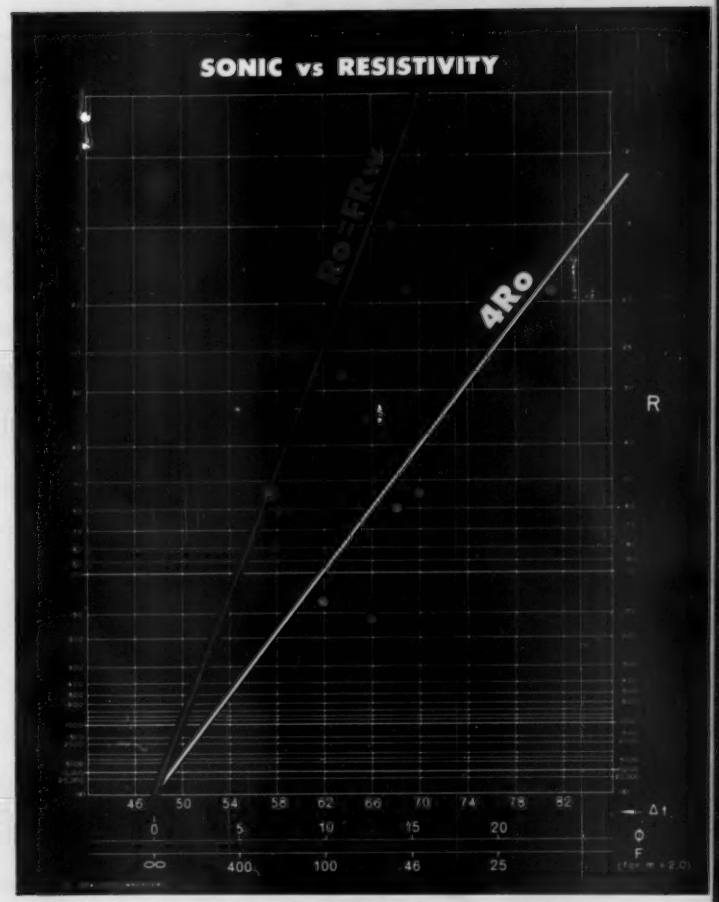
Schlumberger Sonic and Resistivity Logs Simplify Oil Finding!

Oil and gas horizons are graphically identified by simple comparisons of Sonic and Resistivity data. These fast methods of interpretation are appropriate for well-site application. Potentially productive zones thus found can be further investigated by quantitative methods—or can be checked by sidewall cores and formation tests.

Ask a Schlumberger engineer in your area to demonstrate the benefits you can derive from Sonic and Resistivity Logs in your well program.

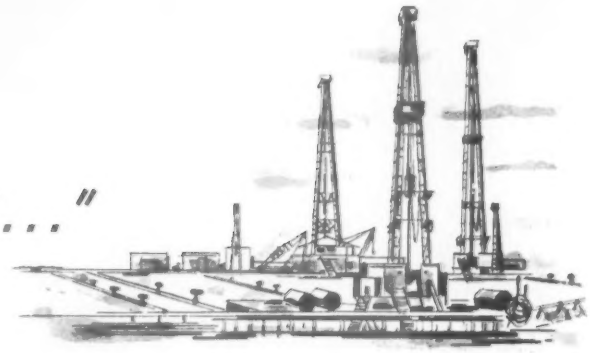
THE EYES OF THE OIL INDUSTRY®

SCHLUMBERGER



when they say:

"It's Easy as ABS..."



Oilmen have a language all their own. Coined words and phrases wildcat all through the industry, and seem to move from slang to accepted usage in their dictionary overnight. The reason is that oilmen use words that say what they mean. That's why when they say something is "easy as ABS" they're talking about a permanent job that can be done quickly, effortlessly, and inexpensively.

Oilmen have learned that Western ABS semi-rigid plastic pipe is effortless to carry . . . quickly jointed, easily sawed, drilled or threaded, can be permanently solvent welded in seconds and the ready-to-use ABS pipe fittings require only the simplest tools.

They know, too, that ABS plastic pipe costs less to buy and costs less to install . . . and it has superior resistance to corrosion, chemicals and crude oil . . . will not rust or scale and is free from electrolytic action. Its smooth interior means lower friction, faster flow. It has both high impact and high tensile strength as well as high temperature resistance. Its high serviceability virtually eliminates the need for replacement.

As salt-water well tubing, as salt-water gathering and disposal lines, as oil flow lines . . . Western ABS semi-rigid plastic pipe is without equal in the oil fields.

It's as easy as ABS to use

For further information write, wire or call

WESTERN PLASTICS CORPORATION

1515 W. 2nd Street • Hastings, Nebr. • Phone 3-1361

Mississippi adds Yazoo County field

VIRTUAL assurance of another Lower Cretaceous field for South Mississippi is given in a wildcat discovery by Humble Oil & Refining Co. in southeastern Yazoo County.

Humble's indicated discovery well has not been completed, but tests of a basal 8-ft. zone at 10,445-53 ft. in the Hosston, lowermost Lower Cretaceous member, have ended with a daily flow rate, on a 4-hour gage through ⅛-in. choke, of 198 bbl. Flow was under pressure of 1,075 psi. with gas-oil ratio of 510 cu. ft. per bbl.

The well, 1 Thompson et al., previously has flowed at the rate of 451 bbl. daily through ½-in. choke (5-hour gage). Initially, with the bottom 3 ft. at 10,451-53 ft. open, it flowed at the rate of 612 bbl. daily, through 1-in. opening. Gravity of the oil is 40.4°.

Operators now are testing a higher Hosston zone at 10,297-10,315 ft. before completing the well as a possible dual producer.

Location, northeast of Bentonia, is 8 miles southeast of Tinsley field, productive from Upper Cretaceous sands. Nearest Lower Cretaceous production has been at now-abandoned Virlillia field, 9 miles east in Madison County. Current nearest Lower Cretaceous production is in Bolton field, Hinds County, more than 20 miles south.

Third strike for Texas' deep Edwards

ADDITIONAL IMPORTANCE is being attached to the Person deep Edwards field in Karnes County, South Texas, following completion of the third well in the new fault block development north of the original and—so far—main producing area.

The new well, drilled by Shell Oil Co. on its Charles Kainer lease, is completed with a potential flow of 273 bbl. of 34°-gravity oil daily through 12/64-in. choke. Its Edwards pay is perforated at 10,956-80 ft. Flow was gas-oil ratio of 1,485 cu. ft. per bbl. and pressure of 1,350 psi. The well makes a small amount of water.

The new development is on the downthrown side of the main Person fault. It is about ½ mile from the older and more extensively developed upthrown side.

Production on this side of the fault was opened earlier this year by Shell at its 1 Jerome Pawelek, completed originally as an oil well from perforations at 10,974-86 ft. More recently, the well has been recompleted as a rich gas-condensate producer from a higher interval at 10,886-10,912 ft. Shell's second well, 1 Emil Laskowski, on this side of the fault was productive of gas and condensate at 10,900-12 ft.

Active exploration for deep Edwards production in Karnes County is spreading to the Runge area, in the southeastern corner, where Socony Mobil Oil Co., Inc., is starting a test with a 14,500-ft. objective. Previous drilling in that part of the county has been to Pettus and Wilcox sands. Nearest Edwards production is Texas Eastern Transmission Co.'s new discovery well, 1 Herman A. Garbe, 5 miles east and just across the county line in DeWitt County.

The latter well, shut in since September, is productive of gas and condensate from the Edwards pay at 13,881-13,910 ft. On prepotential tests, it flowed at the rate of 2,720 M.c.f.d. of gas through ¼-in. choke. Condensate was not gaged. Potential tests now are under way.

Shallow Texas well taps new pay zone

Queen City production opened last week by George H. Coates in Southwest Texas' northeastern Gonzales County is the first from that lower Claiborne horizon in the county.

Its discovery well is productive of dry gas, potentialed at 4,800 M.c.f.d. (open flow). Pressure through ¼-in. choke 483 psi. Pay is at 1,731-36 ft. in hole drilled to 2,502 ft.

Location is in the J. Gibson Survey, 4 miles southeast of Waelder.

Arkansas portion of Arkoma gets deep test

The southern side of the Arkansas portion of Arkoma basin in Central Yell County is to get a deep test in a far-removed wildcat being started by K & H Operating Co.

Projected depth of the wildcat is 10,000 ft. with the Pennsylvanian Morrow formation as its objective.

Location of the test, 1 Government, in Ouachita National Forest, is a little over 3 miles southwest of Danville.

Sands of the Morrow group are expected about 9,800 ft. Atoka sands, from which most of the basin's gas production is found, should come in from 4,500 through 8,700 ft.

In the meantime, the basin is opening another in the succession of new gas fields which have been found within the past year. Discovery well is J. M. Huber Corp.'s 1 Mabry, 3 miles northwest of Scranton, in northern Logan County, which adjoins Yell County on the north.

The well is being completed dually in the Atoka Woolsey and Hale sands. The former is perforated at 7,013-15 ft., 7,018-22 ft., and 7,044-52 ft.

The well is being completed dually in the Atoka Orr and Woolsey and Hale sands. The Orr sand, perforated at 6,745-74 ft., tested 3,800 M.c.f.d. of gas after acidization and fracturing. The Woolsey sand, perforated in three intervals from 7,013 ft. through 7,052 ft., and the Second Hale sand, perforated in five intervals from 7,215 ft. through 7,373 ft., are to be produced together. Testing still is under way.

Green River adds big oil strike for Wyoming's Arch unit

Another big oil well and the second best yet for Wyoming's Arch unit in Sweetwater County, Green River basin, is Forest Oil Corp. 16 Arch 7-1, C NW SW 7-19n-98w. This well flowed 1,340 bbl. of oil daily through 24/64-in. choke from Almond Cretaceous perforations at 4,837-58 ft.

This is the northernmost well on the trend. The largest well yet on the trend was Forest 15 Arch 23-1 in C SE SE 23-19n-99w. It flowed 1,800 bbl. per day through 32/64-in. choke from Almond perforations at 4,573-4,606 ft. It lay on the west side of the Patrick Draw part of the trend. Almond production runs more than 6 miles from the north end of the trend south and southwest through Arch, Beacon Ridge, and Patrick Draw units. The widest point is at the southeast line of the Beacon Ridge unit—3 miles wide.

Discovery wells

COLORADO

Rio Blanco County:

Shannon Oil Co. 1 Government, C SE SE 13-4s-98w. IPF 500 M.c.f.d., open flow, Basal Tertiary discovery, new field. TD 6,211 ft.

Routt County:

Caswell Silver-Joseph Cramer 1 Featherstone, NE NE 23-5n-88w. IPP 32 BOPD, 40°, Niobrara open hole 4,944-5,593 ft. Pay at 5,496-5,593 ft. TD 5,593 ft. Niobrara discovery, new field.

SOUTH LOUISIANA

Plaquemines Parish:

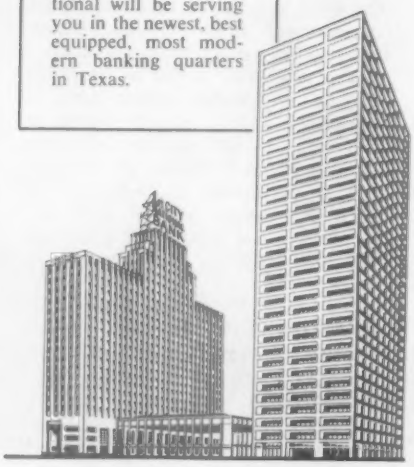
U. S. Oil of Louisiana 3 John Vaccaro, 3-17s-26e. IP 232 BOPD, 3,700 M.c.f.d., ¼-in., 43.7°, TP 3,250 psi., perf. 11,210-12 ft. TD 12,520 ft. New pay in Diamond field.

(Continued on page 184)

Saves Time!

When you talk to the men of the First City National Oil and Gas Department about financing you can get to the point fast. These men are thoroughly experienced in production, refining, transportation and marketing – in petrochemicals, too. And because of their daily familiarity with complex financial problems, you can get a quicker decision. When time counts, that's important! Come in to see us.

SOON! First City National will be serving you in the newest, best equipped, most modern banking quarters in Texas.



FIRST CITY
NATIONAL BANK OF HOUSTON

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

▶▶▶ Personals

Harold Burrow, executive vice president and a director of Tennessee Gas Transmission Co., has moved up to succeed **Gardiner Symonds** as president of the company. Symonds will continue as chairman and chief executive officer. **R. L. McVey,** senior vice president, has been elected executive vice president, and **W. C. McGee, Jr.,** has been elected a director. McGee, president of TGT's largest operating division, Tennessee Gas Pipeline Co., succeeds **Ardon B. Judd** as a director. Judd has retired as director emeritus. Burrow, 46, joined Tennessee Gas shortly after it was organized in 1943 and acted as purchasing agent and then director of purchasing in acquiring pipe and equipment for the original company gas line from South Texas to West Virginia. In 1949 he became manager of gas supply and the following year, vice president. By 1954 he was senior vice president. Two years ago he became executive vice president. Last year he was elected to the board. The personnel changes accompanied TGT's announcement of plans to reorganize corporate structure to fit growing operations and interests (for details see p. 81).

BURROW

McVEY

McGEE

R. (Cotton) Makin has accepted the position of consultant to Chinese Petroleum Corp., for operations in Formosa. He will headquarter in Taipei, Formosa. Makin was president of Makin Drilling Co., Hobbs, N. M., from 1945-1959.

Malcolm D. Young, Jr., geologist with Gulf Oil Corp. in Houston, has resigned to open offices as consultant and independent operator in Broomfield Heights, Colo. Young was with Gulf in the Rocky Mountain area for 9 years before moving to Houston several months ago.

Fred Kalenborn, Standard Oil Co. of California, has been named chairman of the San Joaquin Valley chapter of American Petroleum Institute. Other new officers are **Jack Rogers,** Honolulu Oil Corp., first vice chairman; **T. S. Melby,** Reserve Oil & Gas Co., second vice chairman; and **T. J. Abshier,** Mobil Oil Co., third vice chairman. **Gene Nichols,** Richfield Oil Corp., is outgoing president.

Robert N. Curry, assistant superintendent of gas measurement for Texas Gas Transmission Corp., has been appointed assistant superintendent of dispatching. He will continue to headquarter in Owensboro, Ky. Curry has been with Texas Gas since 1949.

Spencer R. Milliken has been named research director for Northern Illinois Gas Co. He succeeds **Earl L. Tornquist,** who will retire early next year. Tornquist was named research director a few months ago.

R. A. Follansbee, Rocky Mountain division land man for Murphy Corp., has been placed in charge of special assignments for the division. **Harry Simmons,** El Dorado, Ark., will succeed Follansbee.

Hans R. Wolfe has joined Ethyl Corp.'s Detroit research laboratories as chemical engineer in the refinery-technology division. He was with Creole Petroleum Corp. in Venezuela and Lago Oil & Transport Co. in the Netherlands before joining Ethyl.

Carl G. Drescher, vice president of Sinclair Oil Corp., has been named coordinator of foreign market development. He will coordinate foreign sales activities of Sinclair subsidiaries with particular emphasis on Venezuelan crude and products. The appointment is part of Sinclair's program for expansion of foreign marketing operations.

Richard E. Faggioli, California area manager for Humble Oil & Refining Co. in Los Angeles, is scheduled to be transferred to Houston as an assistant to the president of Humble. **N. N. Jones,** area production superintendent for Humble in Los Angeles, has been named acting area manager. The change is scheduled to take place near the first of the year.

Dr. Leo J. Peters, vice president and associate director of Gulf Research & Development Co., research subsidiary of Gulf Oil Corp., has been promoted to vice president and general administrator of the company. In this post he will be responsible for operations of the Harmarville, Pa., laboratory. Peters joined Gulf Research in 1929. He was named director of geophysical operations in 1945 and in 1951 assumed added responsibilities as an assistant director of research. He was named associate director of research and vice president in 1953.

Mohamed Mortada, research associate in Mobil Oil Co.'s Dallas research laboratory, has been given a temporary assignment with Mobil International Oil Co. as reservoir engineering specialist in New York.

Paul E. Owens, general sales manager of American Independent Oil Co., has been elected vice president, marketing. Owens was assistant manager, Western Hemisphere, for Gulf Oil Corp.'s crude-oil department before joining Aminoil last year.

Dr. John Lohrenz has been named research engineer for Continental Oil Co. in Ponca City, Okla. Lohrenz recently received his doctor's degree in chemical engineering at Kansas University. He was a research chemical engineer with Ethyl Corp. before returning to Kansas as a student and instructor in chemical engineering.

Paul D. Meek, manager of Cosden Petroleum Corp.'s technical department, has been named manager of the new chemical department. The new department has been formed as part of a reorganization of Cosden's refining division, which has been renamed the refining and chemical division. Meek will be responsible for chemical sales, chemical research and control, and various chemical-producing units. Also in the chemical department, **W. M. Preston** has been named manager of polystyrene sales. **Lester L. Beauvais** will be technical-service manager. **Kenneth W. Perry** and **Arch Ratliff** will handle aromatics and solvents sales. **Tom Ivey** is office manager in chemical and plastics sales, and **Rene Brown,** chemical engineer, will head chemical research and control. **George Grimes,** general superintendent, will continue to head the refining department.

GETGOOD

LEARNED

HOUCHIN

HARDER

Four to Join Board of Canadian Firm

John Getgood of Phillips Petroleum Co., is slated to become president and a director of Pacific Petroleums, Ltd., Calgary, when Pacific Petroleums' acquisition of Canadian holdings of Phillips and Sunray Mid-Continent Oil Co. goes through.

Two other Phillips men and one from Sunray will join the Pacific board. They are S. H. Learned, chairman of Phillips' executive committee and assistant to the president; John Houchin, vice president of Phillips; and H. O. Harder, Sunray's senior vice president in charge of exploration.

Purchase of Phillips and Sunray holdings is still subject to approval of Pacific Petroleums stockholders at a special meeting later this month.

Getgood, manager of the sales and development division in Phillips' international department, will succeed George McMahon as president. McMahon will continue as a director and his brother, Frank McMahon, will continue as chairman.

Executive committee members will include the McMahon brothers; Getgood; K. H. Gibson, Pacific Petroleums executive vice president; and A. P. Bowsher, vice president and treasurer of the Canadian company.

Phillips and Sunray will receive common stock of Pacific Petroleums in exchange for their properties. The exchange will bring Phillips' total ownership in the company to 39% of the stock, and Sunray's ownership to 5.8%.

Boydon Jann has been named manager of Gulf Oil Corp.'s Cincinnati marketing division. He has been with Gulf since 1930.

A. S. Gilliam has resigned as vice president and plant manager of Great Northern Oil Co. He had been with the company since 1956. No successor has been named.

Dr. Marion B. Geiger has been named director of international development for Hooker Chemical Corp. He will move his headquarters from Niagara Falls, N. Y., to New York City.

George R. Berman and **William G. Paxton** have joined Monsanto Chemical Co.'s plastics division in Springfield, Mass. **Paul S. Gupton** has joined the engineering department in Texas City, and **Billy D. Vineyard** has joined the organic chemicals division in St. Louis.

Stanley A. Brozek, acting shift leader in the crude area of Tidewater Oil Co.'s Delaware City, Del., refinery, has been promoted to shift leader, crude area. **Henry E. Graper, Edward J. Kowalski,** and **Joseph Diskin,** operators in the utilities and sulfur-recovery area, have been promoted to shift leaders in this area. **John Frayne,** operator in the utilities and sulfur-recovery area, has been named acting shift leader, utilities and sulfur-recovery.

A. D. McIntyre, group leader for Shell Chemical Co. in styrene-resin research at the Torrance plant in Los Angeles, has been promoted to section leader, plastics and resins. **D. A. Walker,** research technologist, has been named group leader, plastics and resins.

George F. Williams, Seattle, has been named commercial-sales engineer for the northwest division of Union Oil Co. of California. He will be responsible for development of new products and promotion of existing products in the Alaska, Washington, and northern Idaho area.

V. H. Gibson, general credit manager and assistant treasurer of Skelly Oil Co., was recently named general manager of marketing. He steps into the post formerly held by **Paul A. Tanner,** who was named marketing vice president in July. **Van Bartles** has succeeded Gibson as general credit manager. **R. C. Weidemier** has replaced Bartles as assistant general credit manager.

▶▶▶ Personals

Bob Saunders, Pure Oil Co. geologist, will be in charge of the company's new Anchorage office.

E. B. Brauer has joined Union Oil Co. of California as petroleum engineer in Abbeville, La.

James A. Lands has been promoted to sales manager of Gulf Oil Corp.'s Austin, Tex., area. He moves to Austin from Houston.

John G. Porter, Jr., engineer with Socony Mobil Oil Co. in Paulsboro, N. J., has been promoted to engineer in the New York City office.

R. M. (Bob) Borden, formerly with Peter Bawden Drilling, Ltd., has been elected vice president and a director of S & T Drilling Co., Ltd., Edmonton.

Dr. J. Howard Brown has been named manager of research for Hooker Chemical Corp. **Robert F. Schultz** has been named manager of process development. **Dr. Alvin F. Shepard** has been named senior scientist.

H. L. McLaurin and **W. N. Robertson,** operations specialists in the polyethylene department of Dow Chemical Co.'s Plaquemine, La., plant, have been promoted to shift supervisors in polyethylene. **M. J. Skinner** has been promoted to group supervisor in engineering and maintenance at the plant.

Paul L. Kartzke, vice president in charge of exploration and production for Shell Oil Co. of Canada, Ltd., in western and northern Canada, has been named executive vice president of the company. Kartzke had been vice president for Shell of Canada in Calgary since 1951. He has been with the Shell companies since 1935. Kartzke's new headquarters will be in Toronto. The appointment is effective January 1.

R. E. Mitchell has been named area project superintendent in Shell Oil Co.'s Houston area gas department. He will work with preliminary planning of new plant projects and will supervise project engineers assigned to new projects. Mitchell has been with Shell since 1944. He most recently was on assignment with Shell de Venezuela.

▶▶▶ Personals

Robert G. Reed III, marketing manager of Tidewater Oil Co.'s eastern division, has been promoted to assistant division general manager. He succeeds **I. E. Chapman,** who has been transferred to Tidewater's western division in Los Angeles. **Donald Y. McCoy,** retail sales manager for the

REED

McCOY

eastern division, will succeed Reed as eastern division marketing manager and a member of the division advisory committee. Reed is a former assistant middle-Atlantic district marketing manager for Tidewater in Philadelphia. He had been eastern marketing manager since 1958. McCoy was New England district marketing manager before moving to eastern division retail sales.

K. W. Wiseman has been promoted to field production and exploration manager, a new position, for Mobil Oil de Venezuela. He will headquarter in Anaco and will be responsible for both eastern and western Venezuela.

Domingo Casanova has been named coordinator of special studies in Creole Petroleum Corp.'s production department. Casanova has previously served Creole as petroleum engineer, second district superintendent, and division superintendent of production in western Venezuela.

James R. Parrish, formerly with Phillips Petroleum Co., has been named central division marketing manager for Frontier Refining Co. in Denver. He will supervise marketing activities in Colorado, and parts of Nebraska, New Mexico, and Kansas.

James R. Puckett has been appointed producing superintendent of Mobil Oil Co.'s Casper, Wyo., exploration and producing district. Puckett joined the Socony Mobil companies in 1945 as petroleum engineer in Duncan, Okla. Since then he has been district petroleum engineer in Oklahoma, division petroleum engineer in Kansas, petroleum engineering specialist in West Texas, and drilling and production section chief in the Denver division engineering section.

R. W. Roberts has been promoted to research-chemical engineer in the Ponca City, Okla., process laboratory of Continental Oil Co.'s petroleum products-research division.

Charles Wright, head of Oilwell Research, Inc., Long Beach, has been elected chairman of a newly organized group to study water-flood bacteriology. The group will work as part of the fluid-injection committee of the Pacific Coast API. **Preston Hill,** Signal Oil & Gas Co., has been named vice chairman and **Charles Parent,** Long Beach Harbor Department, secretary.

Robert Nesbit, Gulf Oil Corp., has been elected president of San Joaquin Geological Society. Other new officers are **Robert Lindblom,** Standard Oil Co. of California, vice president, and **David Callaway,** who is with Richard S. Rheem, independent operator, secretary-treasurer. **Joseph A. Dunwoody,** Tidewater Oil Co., is the outgoing president.

C. V. Sternling, engineer at Shell Development Co.'s Emeryville, Calif., research center and **L. E. Scriven,** University of Minnesota, will receive American Institute of Chemical Engineers' Allan P. Colburn award this week at the group's annual meeting in Washington. The award recognizes institute members under 35 who have made outstanding scientific contributions to the institute's journals. The paper written by Sternling and Scriven is the first dealing with basic research in petroleum to win the Colburn award.

Donald L. Connelly, Houston, senior vice president and a director of Warren Petroleum Corp., has been elected 1961 president of Mid-Continent Oil and Gas Association. Retiring president is **W. J. Goldston,** Houston independent. Other officers are **Harold Decker,** Highland Oil Co., Houston, first vice president; **Joe Dickerson,** executive vice president, and **Clarel Mapes,** secretary-treasurer. Regional vice presidents are **T. H. Marshall,** Anderson-Prichard Oil Corp., Oklahoma City; **John F. O'Shaughnessy,** Lario Oil & Gas Co., Wichita; **Estill S. Heyser, Jr.,** Heyser & Heard, Dallas; **N. H. Wheless,** Wheless Drilling Co., Shreveport, La.; **C. H. Murphy, Jr.,** Murphy Corp., El Dorado, Ark.; **C. F. Heidelberg, Jr.,** Heidelberg, Woodliff, Castle & Franks, Jackson, Miss.; **Victor H. Lott,** Merchants National Bank, Mobile, Ala.; and **Fletcher F. Farrar,** Farrar Drilling Co., Mount Vernon, Ill.

M. H. Clark, superintendent of Continental Oil Co.'s Wichita Falls, Tex., refinery, has been appointed manager of the Panama refinery of Refineria Panama, S.A., a subsidiary of Conoco and National Bulk Carriers, Inc. The company is building a refinery on Payardi Island near Colon, Panama. The refinery is scheduled for completion in early 1962. **Nat H. Neville,** Ponca City, Okla., has been named controller of Refineria Panama. Both men will headquarter in Panama. Clark has been with Conoco since 1930. He was assistant refinery superintendent at Lake Charles, La., before being named Wichita Falls superintendent in 1958.

CLARK

T. C. Morrow, owner of T. C. Morrow Oil Co., T. C. Morrow Drilling Co., and Wanda Petroleum Co., has been elected a director of the Continental Bank in Houston.

Dr. Herman E. Ries, Jr., has been appointed senior research associate at the Whiting, Ind., research laboratories of Standard Oil Co. (Ind.). Ries has been with Indiana Standard since 1951.

W. J. Harrell, manager of the retail-sales department of Shell Oil Co.'s Atlanta division, has been named manager of the company's new Dallas-Fort Worth district sales office. He has been with Shell 28 years.

JENKINS

R. R. Jenkins, assistant manager of marketing for Continental Oil Co.'s southwestern region, Fort Worth, has been promoted to director of marketing research. He will headquarter in Houston. Jenkins succeeds **N. L. Turkevich,** who has resigned. Jenkins has been with Conoco since 1948.

Dr. Juan Jones Parra, coordinator of oil-field conservation for Mobil Oil Co. de Venezuela, has been named manager of production and conservation with headquarters in Caracas. Jones Parra was with the Ministry of Mines and Hydrocarbons and the Venezuelan Petrochemical Institute before joining Mobil.

Personals

Dr. Soma Kurtis, manager of Aurora Gasoline Co.'s products-control department, has been promoted to assistant to the vice president, a new position. Kurtis will be responsible for products control and refinery laboratory activities. **C. E. Miller,** assistant manager of products control, will succeed Kurtis as manager. **M. R. Doran, Jr.,** a coordinator, has moved up to assistant manager.

KURTIS

H. F. Simmons, Southwest Louisiana division geologist for Shell Oil Co., has been named Corpus Christi, Tex., division exploration manager. He succeeds **J. H. Pittinger,** now on special assignment. Simmons has been with Shell since 1949. He had been district geologist in the Tulsa area and Baton Rouge district geologist before his Southwest Louisiana appointment last year.

James R. Ording, Humble Oil & Refining Co., has been elected president of the Houston Geophysical Club. Other 1961 officers include **Louis Poindexter,** independent geophysicist, first vice president; **Louis McManis,** Southwestern Industrial Electronics, second vice president; **Mona Guiler,** Humble, secretary; **Robert Baum,** Seismograph Service Corp., treasurer; and **Ted P. Ellsworth,** Geophysical Service, Inc., board chairman.

Charles L. Nale has been promoted to area sales manager for Tidewater Oil Co. in Baltimore. **Lewis J. Thomas** has been named Harrisburg, Pa., area sales manager.

B. F. Stradley, vice president and treasurer of Phillips Petroleum Co., has been elected financial vice president, a new position. Stradley is a director and member of Phillips' executive committee. He has been with the company since 1924. **W. F. Martin,** secretary of the company, will succeed Stradley as treasurer. **R. N. Sears,** assistant to the executive staff, has been elected secretary. **O. W. Armstrong** has been named assistant treasurer succeeding **T. V. Stevens,** who has retired.

Edward J. Brook, Fort Worth, president of McElroy Ranch Co., and **Lamont E. Smith,** Wichita, president of Franco Central Oil Co., Wichita, have been named assistants to the president and members of the executive committee of Franco-Wyoming Oil Co. **Harry D. Campbell,** Bakersfield, Calif., has been named vice president in charge of operations, a director, and member of the executive committee of McElroy Ranch Co., a subsidiary of Franco-Wyoming. The changes follow reorganization of Franco-Wyoming's subsidiaries.

W. H. Helmerich has been elected chairman of Helmerich & Payne, Inc., after 40 years as president of the Tulsa firm. The elder Helmerich founded the company in 1920. He will be succeeded as president by **Walter H. Helmerich III,** executive

HELMERICH

HELMERICH III

vice president and a director. The younger Helmerich has been with the company since 1950. He is president of Helmerich & Payne, C.A., Venezuelan drilling subsidiary, and a director of White Eagle Overseas Co., Inc., a Philippine exploration affiliate.

Thomas E. Curry has been named sales manager for Gulf Oil Corp.'s new Dallas area. The appointment is part of Gulf's reorganization of domestic marketing operations.

Warner T. May has been named manager of the Bureau of Land Management's Anchorage, Alaska, land office. He will succeed **Irving T. Anderson,** who has been transferred to Portland, Ore. The appointment is effective January 1. May has been head of the Juneau, Alaska, land office since 1957.

Deaths

Louis L. Stephens, 85, retired general counsel and a director of Standard Oil Co. (Ind.), died November 18 in a Pierre, S. D., hospital. Stephens joined Indiana Standard in 1924 as chief counsel. He was a leading figure in a proxy fight for control of the company's board in the late 1920's and later was active in winning Indiana Standard's fight for rights to the company-developed thermal cracking process.

S. S. Zamierowski, 56, Grand Rapids, Mich., attorney for Michigan Consolidated Gas Co., died November 16 after a heart attack.

Richard J. Coughlin, Sr., president of Westland Oil Co., Minot, N. D., died November 23 while en route to Seattle. He was a past president of National Oil Marketers Association.

Charles E. Blair, 85, retired Tulsa independent operator, died November 28 in a Tulsa hospital. Blair was production superintendent for Oklahoma Natural Gas Co. and had been with Braden Steel Co. before becoming an independent in the mid-1930's.

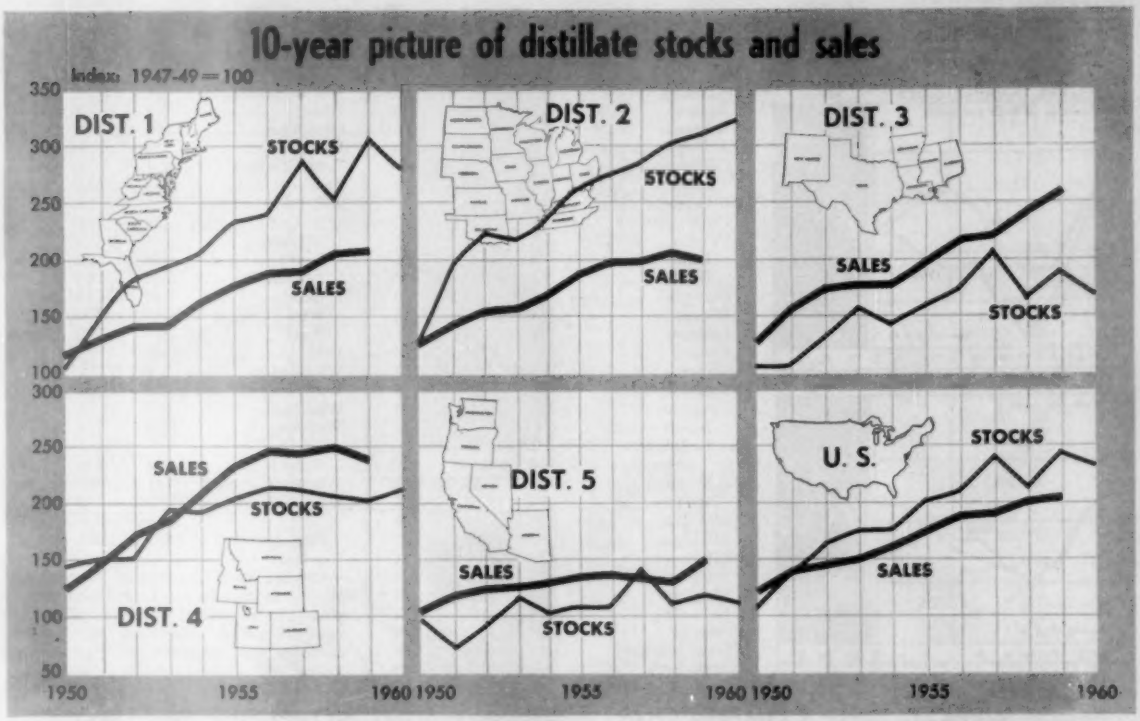
Jay K. Livingston, 76, retired Houston oil man, was fatally injured in an automobile accident near Nacogdoches, Tex., November 21. Livingston was president of the old Livingston Petroleum Co. in Tulsa at one time.

Harry Dean, 72 retired assistant treasurer of Warren Petroleum Corp., died November 26 in a Tulsa hospital after several months' illness. Dean was secretary-treasurer of the old Devonian Co., Warren subsidiary, until its liquidation in 1952. He retired in 1958.

Ralph B. Pringle, 76, retired Tulsa oil man, died November 26 at his home after several months' illness. Pringle had been vice president and general manager of the old Tidal Oil Co., Mid-Continent producing subsidiary of Tidewater Oil Co. He entered the oil business in western Pennsylvania as a young man, moving to Tulsa in 1912 as salesman for a natural-gasoline plant equipment company. He soon joined the Waite Phillips interests and was with Independent Oil & Gas Co. before joining Tidal.

Dr. Russell Morley Otis, 60, vice president of Oil Shale Corp., Beverly Hills, Calif., died November 19 in a Los Angeles hospital.

John F. Mann, 61, sales representative for Shell Oil Co. in Houston, died November 22.



HEAVY LINES ON EACH CHART represent indexes of distillate sales since 1950. Light lines picture distillate-stock trends for the same period. Indexes for all lines are based on averages for 1947-49. All stock figures are for the end of September.

Stocks outgain demand in big districts

BY JOHN C. CASPER

DISTILLATE STOCKS have climbed faster than demand over the past 10 years. Since the comparison is between stocks, expressed in barrels, and demand, measured in barrels daily, all series have been plotted as indexes. The base for each series is the average for the 1947-49 period.

For the country as a whole, the distillate-stock index moved up from 109 on September 30, 1950, to 236 for the end of September this year. This is a gain of 127 index points with each point representing 1% of the 1947-49 average.

Total distillate sales increased from 122 in 1950 to about 209, estimated for the current year. Sales gained about 87 index points. Again each point represents 1% of the 1947-49 average.

In the breakdown by districts, stocks in District 2 show the greatest proportionate gain over sales. This unequal rate of gain is shown by the spread between the light and heavy lines on the District 2 chart.

Note the leveling off of sales in District 2 over the past 4 years. Total distillate sales for the district amounted to 197,000,000 bbl. in 1956 and had grown only to 199,000,000 bbl. by 1959. There were actual decreases in industrial sales and in the market for range oil. In addition there was a decided slowdown in the heating-oil segment. Sales of distillate for heating gained 28,500,000 bbl. between 1953 and 1956 but only 7,400,000 bbl. in the 1956-59 period.

Here are several significant facts about distillate stocks and sales for the past 10 years:

... Districts 1 and 2 accounted for 80.5% of domestic distillate sales last year and for 81.9% of the gain in sales since the 1947-49 base period.

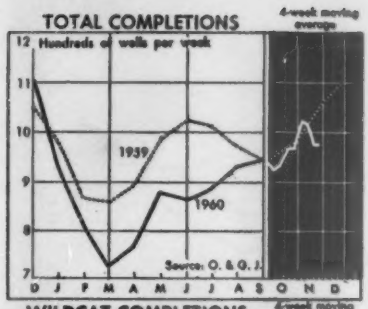
... District 5 has had the smallest percentage gain in both stocks and sales.

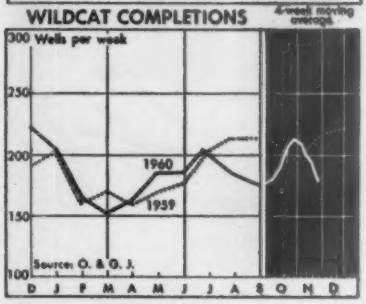
... District 4 had an above-average percentage gain in demand but the lowest volumetric increase.

... District 1 had the largest volumetric gain in stocks and District 2 the largest percentage gain in the past 10 years.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,992,485	UP	17,355	DOWN	21,164
Crude stocks	237,036,000	UP	1,390,000	DOWN	19,360,000
Completions	948	UP	5	DOWN	206
Refinery runs	8,092,000	UP	105,000	UP	119,000
Gasoline stocks	187,906,000	UP	2,995,000	UP	8,727,000
Kerosine stocks	37,099,000	UP	266,000	UP	5,407,000
Distillate stocks	175,741,000	UP	414,000	UP	4,855,000
Residual stocks	48,958,000	UP	995,000	DOWN	7,231,000
Four-product stocks	449,704,000	UP	4,670,000	UP	11,758,000
Total imports	1,876,200	UP	263,600	UP	82,200





Active Rotary Rigs

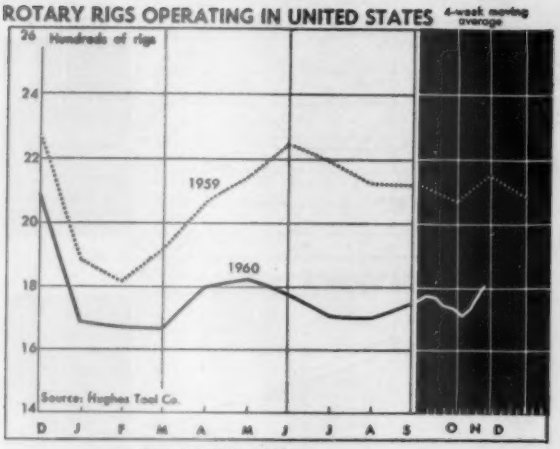
	11-28-60	11-21-60	11-30-59
Alabama	5	3	6
Alaska	8	8	(†)
Arkansas	10	12	15
Arizona	1	2	0
California	74	72	95
Land	71	69	90
Offshore	3	3	5
Colorado	43	44	53
Florida	4	4	1
Land	2	2	1
Offshore	2	2	0
Georgia	0	1	0
Illinois	33	40	42
Indiana	8	8	7
Iowa	0	0	0
Kansas	129	135	157
Kentucky	6	6	8
Louisiana	274	288	330
North	35	39	46
S. Inland waters	104	103	127
S. Land	79	89	102
Offshore	56	57	55
Maryland	0	0	0
Michigan	32	30	23
Mississippi	45	49	81
Missouri	1	1	1
Montana	20	22	21
Nebraska	25	23	27
Nevada	0	0	0
New Mexico	114	106	128
New York	2	2	0
North Dakota	11	9	28
Ohio	5	5	0
Oklahoma	200	209	253
Pennsylvania	6	7	13
South Dakota	1	1	5
Texas	657	665	800
S. Inland waters	5	11	5
S. Land	185	181	192
Offshore	0	3	2
North	56	54	200
Panhandle	61	60	(*)
East	47	50	(*)
West Central	‡176	‡174	255
West	127	132	146
Utah	30	32	34
Washington	1	1	1
West Virginia	6	8	4
Wisconsin	1	1	0
Wyoming	64	64	80
Total U. S.	1,816	1,858	2,213
Western Canada	141	147	193
Eastern Canada	0	0	1
Grand total	1,957	2,005	2,407

Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60. ‡Stephens and Eastland counties now included in West Central Texas.

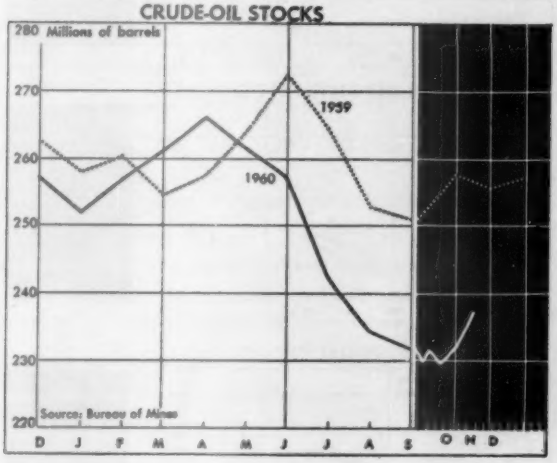
WEEKLY WELL COMPLETIONS . . . WEEK ENDED NOVEMBER 26, 1960

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Arkansas	9	4	0	1	4	0	30,631	550	761	2	0	0	0	2	137	135
California	29	26	0	3	0	0	115,669	1,533	1,397	0	0	0	0	0	274	365
Colorado	16	2	0	3	11	0	97,420	601	702	8	1	0	1	6	303	401
Illinois	63	14	0	0	21	28	131,687	2,132	2,141	11	0	0	0	11	450	361
Indiana	23	9	0	1	13	0	36,526	973	785	6	0	0	0	6	347	265
Kansas	170	80	0	15	59	16	325,073	3,759	3,617	16	1	0	2	13	945	963
Kentucky	37	14	0	3	20	0	54,171	1,977	2,796	6	0	0	0	6	213	335
Louisiana	79	32	7	16	24	0	481,816	3,307	3,444	10	0	0	2	8	507	463
North	41	13	0	16	12	0	97,873	1,296	1,368	6	0	0	2	4	245	209
South	29	12	5	0	12	0	290,052	1,556	1,702	4	0	0	0	4	231	239
Offshore	9	7	2	0	0	0	93,891	455	374	0	0	0	0	0	31	15
Michigan	18	6	0	0	12	0	72,354	861	600	4	0	0	0	4	233	166
Mississippi	9	4	1	0	4	0	84,218	612	581	3	0	0	0	3	236	256
Montana	9	3	0	0	6	0	26,824	312	313	2	0	0	0	2	146	109
Nebraska	12	3	0	0	9	0	61,814	802	819	8	0	0	0	8	352	356
New Mexico	35	17	1	11	6	0	170,945	1,696	1,913	4	0	0	0	4	236	224
West	17	2	1	11	3	0	87,970	617	847	2	0	0	0	2	67	60
East	18	15	0	0	3	0	82,975	1,079	1,066	2	0	0	0	2	169	164
New York	0	0	0	0	0	0	0	282	237	0	0	0	0	0	39	19
North Dakota	2	2	0	0	0	0	6,793	262	402	1	1	0	0	0	76	74
Ohio	23	9	0	7	4	3	53,378	975	993	1	1	0	0	0	46	30
Oklahoma	100	50	0	4	26	20	220,898	4,196	5,045	5	2	0	0	3	635	779
Pennsylvania	0	0	0	0	0	0	0	663	523	0	0	0	0	0	16	19
Texas	277	126	21	10	104	16	1,200,191	14,110	17,033	62	5	3	1	53	2,891	3,209
District 1	41	21	1	0	18	1	90,927	1,013	993	13	0	1	0	12	363	302
District 2	16	2	6	3	5	0	103,185	685	735	4	0	1	1	2	170	213
District 3	19	9	2	2	6	0	129,830	1,067	1,088	9	0	0	0	9	205	215
District 4	23	8	1	0	14	0	116,797	976	1,227	5	2	1	0	2	267	305
East	28	14	2	0	12	0	140,648	1,190	1,149	8	0	0	0	8	245	224
District 7-B	33	19	0	2	11	1	94,967	1,992	2,382	6	1	0	0	5	562	629
West	60	29	3	0	19	9	305,226	3,614	5,105	12	0	0	0	12	571	692
District 9	36	18	1	0	12	5	106,437	2,618	3,185	5	2	0	0	3	455	529
District 10	21	6	5	3	7	0	112,174	955	1,169	0	0	0	0	0	53	100
Utah	5	1	0	0	4	0	30,045	215	284	4	0	0	0	4	81	86
West Virginia	0	0	0	0	0	0	0	774	710	0	0	0	0	0	9	27
Wyoming	31	13	0	4	14	0	171,462	964	878	9	0	0	1	8	390	320
Misc. (Alaska)	1	1	0	0	0	0	10,815	242	213	0	0	0	0	0	161	110
Total U. S.	948	416	30	78	341	83	3,382,730	41,798	46,187	162	11	3	7	141	8,723	9,072
Prev. week	943	421	29	101	354	38	3,866,237	.....	.....	193	20	1	6	166	.....	.....
Cum. 1960	41,798	18,845	1,211	3,526	15,837	2,379	172,045,574	.....	.....	8,723	789	96	294	7,544	.....	.....
Cum. 1959	46,187	23,059	1,129	3,404	17,324	1,271	190,136,093	.....	.....	9,072	805	100	301	7,866	.....	.....
Western Canada	38	26	0	1	11	0	219,374	2,082	2,196	11	1	0	0	10	545	604

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	11-19-60	11-12-60	11-21-59
Pennsylvania Grade	2,310	2,301	2,516
Other Appalachian	1,323	1,400	1,969
Illinois, Indiana, Michigan	9,164	9,046	10,224
Nebraska and North Dakota	2,686	2,936	3,190
Kansas	8,985	9,014	9,605
Oklahoma	15,582	15,430	14,896
Arkansas	1,822	1,878	2,207
Louisiana	18,438	18,096	17,724
North	3,307	2,879	3,157
South	15,131	15,217	14,567
Mississippi, Alabama, Florida	2,038	1,971	2,028
New Mexico	8,778	8,812	8,159
Texas	99,453	98,837	111,377
East Texas	7,436	7,258	8,610
West Texas	46,882	47,156	52,400
Texas Gulf	17,555	17,859	19,597
Other Texas	27,580	26,564	30,770
Wyoming	15,592	15,352	17,176
Other Rocky Mountain	10,421	10,123	9,239
California	25,684	25,955	28,983
Foreign	†14,760	14,495	13,180
Total	**237,036**	235,646	252,473

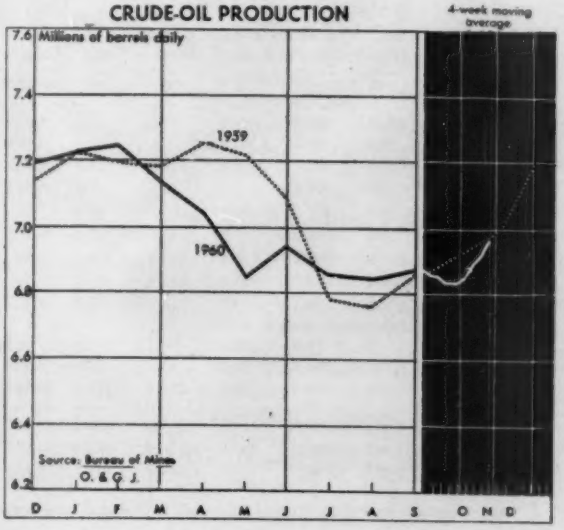
*Bureau of Mines. †Includes 4,859,000 bbl. in California.

DAILY AVERAGE PRODUCTION FOR WEEK

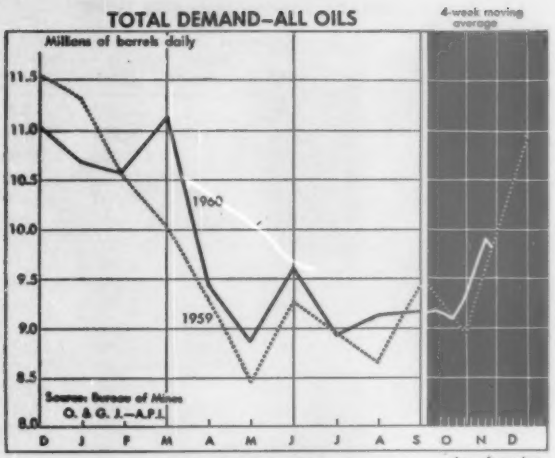
	November 26, 1960			
	Crude oil	Lease condensate	Total	Nov. 19 total
Alabama	21,300	.....	21,300	21,800
Arkansas	74,550	100	74,650	74,550
California	832,950	.....	832,950	832,900
Colorado	131,800	.....	131,800	133,000
Eastern	38,700	.....	38,700	40,100
Florida	950	.....	950	950
Illinois	229,800	.....	229,800	228,100
Indiana	32,200	.....	32,200	32,400
Kansas	†310,110	.....	†310,110	†308,080
Kentucky	58,900	.....	58,900	57,100
Louisiana	967,300	132,650	1,099,950	1,099,875
North	105,300	5,150	110,450	110,375
South	862,000	127,500	989,500	989,500
Michigan	48,100	.....	48,100	47,800
Mississippi	145,575	3,950	149,525	149,525
Montana	82,100	.....	82,100	83,000
Nebraska	66,500	.....	66,500	66,700
Nevada	50	.....	50	50
New Mexico	288,000	8,700	296,700	296,700
North Dakota	65,700	.....	65,700	64,800
Oklahoma	†515,600	.....	†515,600	†500,100
Texas	2,373,000	87,200	2,460,200	2,460,200
Dist. 1	43,000	3,200	46,200	46,200
Dist. 2	99,000	8,300	107,300	107,300
Dist. 3	302,000	38,000	340,000	340,000
Dist. 4	170,000	12,200	182,200	182,200
Dist. 5	25,000	500	25,500	25,500
Dist. 6	102,000	9,800	111,800	111,800
East Texas Field	125,000	.....	125,000	125,000
Dist. 7-B	121,000	250	121,250	121,250
Dist. 7-C	115,000	3,050	118,050	118,050
Dist. 8	975,000	9,000	984,000	984,000
Dist. 9	196,000	1,800	197,800	197,800
Dist. 10	100,000	1,100	101,100	101,100
Utah	112,200	.....	112,200	114,300
Wyoming	362,800	.....	362,800	361,400
Others	‡1,700	.....	‡1,700	‡1,700
Total U. S.	6,759,885	232,600	**6,992,485**	6,975,130
Change from previous week, up			**17,355**	
Canada	†552,500	.....	†552,500	†537,400
Total U. S. production—Jan. 1-Nov. 26				2,319,917,700 bbl.
Same period last year (crude plus cond.)				*2,323,420,600 bbl.

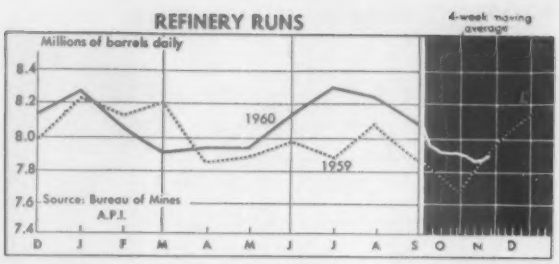
*Includes 62,347,500 bbl. condensate. †Week ended previous Monday. ‡Alaska, South Dakota, and Arizona.

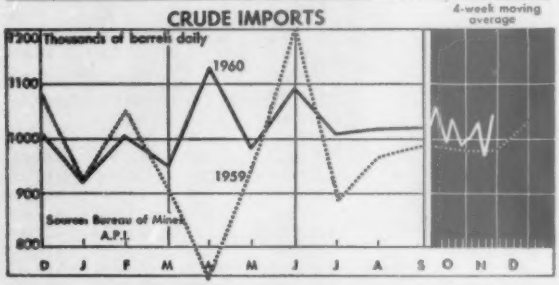
CRUDE-OIL PRODUCTION

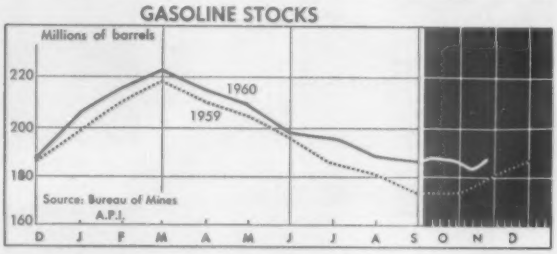


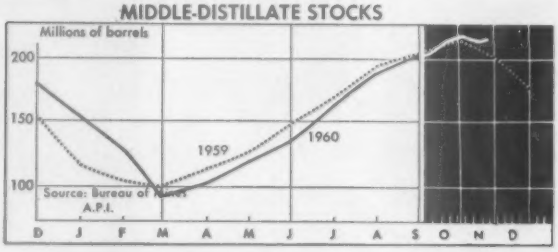
REFINING

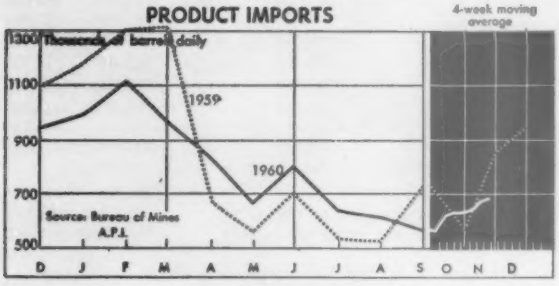


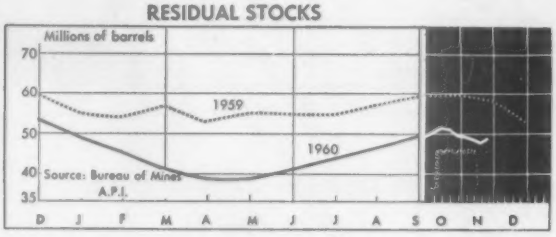












API REFINERY REPORT—NOVEMBER 25, 1960
(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, November 1959: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,044	498.9	38.3	326.6	148.1	45,104	15,710	70,726	14,301	1,141	515.8	36.4	340.1	155.2
Appalachian:														
District 1	100	42.6	5.3	22.0	13.4	5,535	757	4,372	481	93	39.0	3.6	20.9	12.2
District 2	109	56.3	10.6	20.0	12.7	3,001	487	1,803	289	92	53.2	5.3	19.3	14.4
Ind., Ill., Ky.	1,538	786.4	92.0	348.9	153.8	29,829	7,519	31,028	6,486	1,464	758.6	78.5	323.1	195.3
Minn., Wis., Dak.	128	60.4	5.1	30.7	18.7	6,665	1,554	8,915	589	113	56.2	5.5	26.8	20.0
Okla., Kans., Mo.	716	401.1	16.1	182.7	24.1	15,886	1,549	14,224	954	695	372.8	14.5	187.6	28.3
Inland Texas	296	208.0	8.3	46.0	17.1	6,504	573	1,690	2,598	291	214.4	11.2	48.2	19.5
Texas Gulf Coast	1,876	964.1	169.3	491.8	129.6	25,892	3,805	17,030	5,630	1,827	935.2	109.6	450.9	142.0
La. Gulf Coast	661	371.7	63.4	140.6	45.0	10,902	2,271	5,784	1,446	714	376.6	57.7	165.6	49.1
N. La. and Ark.	100	59.4	7.0	18.7	5.9	5,721	980	2,555	140	75	34.8	2.7	19.1	6.6
Rocky Mountain:														
New Mexico	22	11.9	0.6	4.1	3.3	801	41	165	13	26	15.2	0.5	4.9	3.1
Other	287	146.7	3.1	62.4	32.4	5,409	335	3,024	1,164	292	137.8	4.0	64.7	36.7
West Coast	1,215	503.4	24.9	215.1	289.8	26,657	1,518	14,425	14,867	1,161	552.2	3.6	163.6	289.2
Nov. 25, 1960	8,092	4,110.9	444.0	1,909.6	893.9	187,906	37,099	175,741	48,958	7,984	4,061.8	333.1	1,834.8	971.6
Nov. 18, 1960	7,987	4,029.3	467.0	1,876.9	862.6	184,911	36,833	175,327	47,963	.....	.....	.....	.....	.....
Nov. 27, 1959	7,973	4,136.7	333.3	1,843.4	1,005.7	179,179	31,692	170,886	56,189	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	$4.75-4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Buckeye Grade	4.08
Illinois Basin	**3.00-3.05**

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0-35.9°, Fao	1.72
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41.0°-41.9°, Umm Said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Weyburn (light)	2.06
Pembina	2.38
Venezuela:	
Cumbarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Gulf-NY, clean (ATRS—5%)	$2.71
★ Gulf-NY, dirty (ATRS—10%)	2.57
★ Carib.-NY, dirty (ATRS—35%)	1.79
★ PG-UK, dirty (Scale—40%) (34s. 11d.)	4.90

★Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):	
Regular (91 octane)	12.25-12.50
Premium (99 octane)	15.00-15.25
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00
Regular (92 octane)	11.25
Premium (98 octane)	12.25
California (rack) Los Angeles:	
Regular (88 octane)	11.65-12.15
Premium (94 octane)	12.65-13.15
Premium (100 octane)	14.00-14.65
Caribbean area (cargoes):	
Regular (87 octane)	10.125-10.25
Premium (97 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):	
Kerosine 42-44	10.375
Diesel oil (58 d.i. and above)	10.00
Distillate No. 1	10.00
Distillate No. 2	9.00
Gulf Coast (cargoes):	
Kerosine 41-43	9.00- 9.25
Distillate No. 2	8.25
New York Harbor (barges):	
Kerosine 41-43	10.05-10.15
Distillate No. 2	9.05- 9-15
Diesel fuel, 48-52 d.i.	9.35
Caribbean area (cargoes):	
Distillate No. 2	8.125

Residual Fuel (Bbl.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.90
Gulf Coast (cargoes):	
Bunker C fuel	2.30
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
Bunker C	2.10
California (rack):	
Bunker C fuel, Los Angeles	2.25

CLASSIFIED ADVERTISING

. . . your market place

for the oil and gas industry

RATES:
UNDISPLAYED CLASSIFIED 30c a word per issue. 10% discount three or more consecutive issues. $5.00 minimum charge. Blind Box in our care nine words. Payable in advance.

DISPLAY CLASSIFIED
$20.00 a column inch one issue . . .
10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal P. O. Box 1260, Tulsa 1, Okla.

EXCEPT . . .

WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona) Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone AXminister 2-0287.

FOR SALE EQUIPMENT

PETRO CHEM FURNACES 2½ and 5 MM BTU; Clark Centrifugal Compressor 10,000 CFM, 240 PSI; Carrier 1,000 ton Refrigeration Compressor; 2 I.R. Turbo Exhausters 15,000 and 17,000 CFM, 4.85 PSI. Worthington LT6 Compressor; Hot Oil Pumps and Water Pumps 50 to 7,000 GPM; Heat Exchangers 50 to 4,000 sq. ft. Brill Equipment Company, 4101 San Jacinto St., Houston 4, Texas.

FOR SALE: Clark RA-8 crankshaft in excellent condition, main journals and crankpins refinished to standard undersize, prompt delivery. Guaranteed as new. Washington Iron Works, Inc., P. O. Box 28, Sherman, Texas.

GAS COMPRESSORS, new and used, fabricated to your specifications and requirements. 4—9" 60 HP, 2—7" 30 HP, 1—11" 90 HP, 1—13" 150 HP and 1—9" two stage 120 HP. We have these machines on hand and also various sized cylinders to fit them. Independent Field Service, 253 Agurs St., 425-5163, Shreveport, Louisiana.

JOY 200-A DRILL, truck-mounted 6 x 6 GMC. 57' mast, butane-powered, 5 x 10 Wheatley slush pump, Kohler light plant. In good working condition. 1,800' good condition matched length 2⅜" I.F. drill pipe, tool jointed. One thousand-gallon butane tank, trailer-mounted. One platform pipe trailer, complete with necessary tools. J. R. Clouse, Box 1650, Tulsa, Oklahoma.

BURROUGHS (Moon Hopkins) Style 720435 Crude Oil Posting and Calculating Machine Serial #A866930. Set up for Crude Oil Purchasing. Underwood-Sunstrand Posting and Bookkeeping Machine Model "D" Serial DPR282780-24FF-915749. Set up for Sales Register—Refined Products. Both in excellent condition. Write or call: J. P. Dyer, Beli Oil and Gas Company, Box 2007, Tulsa, Oklahoma.

CORE DRILL operators. We purchased Government Surplus core drilling equipment. Will offer at big money-saving prices Contact—Pressey & Son, Pueblo, Colo.

REDA PUMP, 135 HP motor, w/108 stage pump, 150 KVA transformer, 5000' #1 cable Now running. New 7-10-60. For sale or trade for interest in well. O'Connor Petroleum. 111 NW 23rd., Oklahoma City, Oklahoma.

FOR SALE EQUIPMENT

20,000 FEET OF 3½" IF 13.30# Grade E Bottle Neck Drill Pipe with tool joints 4¾" OD. 15,000 feet of 2⅞" IF 10.40# Grade E Square Shoulder Drill Pipe with tool joints 4⅛" OD. Desco, Inc., Oklahoma City, Oklahoma, Box 4423 Phone OR 7-4949.

5,000 GAL. RUBBER lined tank and stand 1550 C Gaso Pump, Bronze Trim. Central Acid Service, Inc., Box 774, McPherson, Kansas. Phone CHapel 1-3865.

GAS METERS: Foxboro and Westcott orifice meters. Late types reconditioned and complete. George Milner. Box 124. Okmulgee, Oklahoma.

CLOSING AN ESTATE
FOR SALE

1—Buckeye Trench Machine, Model No. 120, new 326 horse power Allis Chalmers gas engine. Condition excellent $8,000.00
1—Parsons Trench Machine, Model 88 Trenchmobile mounted on rubber. Condition Good $4,000.00

Phone: Midwest 8-4381
Birmingham, Michigan

FOR SALE:

50,000 Ft. 12¾" OD .281" Wall, New Prime, Electric Weld Pipe API 5L Grade X-42 P. E. Bev., DRL.

$2.75 Per Ft.—Car Load Lots Only

7" OD 23# New Sub Std. Smls. Casing, 8-Rd-Thd ST&C Range 1 & 2 API Drifted and Hydrostatically Tested to 4,000 Lbs. PSI.

$1.75 Per Ft.—Loaded Cars or Trucks

TEXAS PIPE AND SUPPLY COMPANY, INC.
1700 Block Maury Street
P. O. Box 1331, Houston 1, Texas

FOR SALE EQUIPMENT

GAS TREATER in first class condition. Available for immediate delivery. Box M-180, The Oil and Gas Journal, Tulsa, Oklahoma.

MAKE OFFER. Reda Pump, 60 H.P., all accessories. P. O. Box 407, Riverdale, Calif. TOwnsend 7-3594.

ONE BIGNALL and Keeler No. 20 Duplex 10¾" to 20" Pipe Threading Machine. One Bignall and Keeler 6⅝" to 16" Pipe Threading Machine. Each complete with large assortment of dies. Moran Pipe & Supply Company, Seminole, Oklahoma. Phone 566.

PETRO-CHEM ISO-FLOW FURNACES
with STAINLESS CONE & TIP
9MM BTU/HR. Duty; 20' Stack
5MM BTU/HR. Duty; 60' Stack
2½MM BTU/HR. Duty; 64' Stack
2MM BTU/HR. Duty; 36' Stack
HEAT & POWER CO., INC.
60 East 42nd Street; New York 17, N. Y.
310 Thompson Building; Tulsa 3, Okla.

USED CYLINDERS EXC. CONDITION

1—I.R.	XVG.	18½"	x 12"	60# W.P.
4—I.R.	XVG.	15"	x 12"	125# W.P.
6—I.R.	XVG.	7½"	x 12"	350# W.P.
1—I.R.	XVG.	6½"	x 12"	500# W.P.
12—Clark	MA	7½"	x 8¼"	500# W.P.
6—Clark	MA	4½"	x 8¼"	900# W.P.

RUSSEL MYERS
NORTH PENN GAS COMPANY
PORT ALLEGANY, PA.

—PIPE—

2,000,000 ft.	2"	3.50# to the ft.
1,000,000 ft.	3"	7.70#
1,000,000 ft.	4"	10.98#
500,000 ft.	6"	19.80#
200,000 ft.	8 5/8"	28#
440,000 ft.	10¾"	35#
75,000 ft.	12¾"	40#
50,000 ft.	18"	59#

All No. 1 Grade Plain end and cleaned.
INDIANA-OHIO PIPE CO.
P. O. Box 5412 Shep. Sta.
Columbus 19, Ohio
Phone CL 3-5527

JUST PURCHASED

at ESSO REFINERY, Baltimore, Md.

INSTALLED 1955

12,000 BSD Fixed Bed Naphtha HYDROFINER
5,000 BSD Fixed Bed Heating Oil HYDROFINER
3,000 BSD Fixed Bed POWERFORMER

Will Be Sold As Units Or Piecemeal

Catalog being prepared. Ask for your copy.

HEAT & POWER CO., Inc.

Site—Boston & Haven Sts., P. O. Box 5203, Balto. 24, Md., DI 2-0224
New York—60 East 42nd Street, N. Y. 17, N. Y., MU 7-5280
Tulsa—306 Thompson Bldg., Tulsa 3, Okla., DI 3-4890

LOCATED HOUSTON, TEXAS
(from Amoco Refinery Co., Destrehan, La.)

HEAT EXCHANGERS
50 to 4,000 sq. ft.

VESSELS—TOWERS
12" to 8' dia.

PETROCHEM FURNACES
½MM, 2½MM, 5MM BTU

PUMPS
50 to 7,000 GPM

—WIRE—PHONE—WRITE—

BRILL EQUIPMENT COMPANY
4101 SAN JACINTO ST., HOUSTON 4, TEXAS
35-65 JABEZ STREET, NEWARK 5, N. J.

EQUIPMENT WANTED

WILL TRADE 9¼" bore x 13" stroke Worthington gas compressor cylinder for 12" bore x 13" stroke in good working condition. Also need 10¾" liner for same. Box M-177, The Oil and Gas Journal, Tulsa, Oklahoma.

13⅜" BJ automatic casing spider w/slips. 10¾" BJ slip type side door elevator w/slips. Advise price and location. Box M-193, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

SALES ENGINEER

Should have Electrical or Mechanican Engineering degree. Technical sales experience desirable. Send resume to Leon H. Becker, Howell Instruments, Inc., 3479 West Vickery Blvd., Fort Worth 7, Texas.

WANTED—TWO OIL MEN IN ONE

This is a high level job for a man who will be elected an officer of our oil producing company. About one-half of your time will be needed to call on the people who invest in our properties. The other one-half in supervising the drilling, completion and operation of the properties. Previous experience selling and promoting deals helpful in first job and petroleum engineering helpful in second job. Minimum age is 38.

Replies held confidential.

Box M-184, The Oil and Gas Journal
Tulsa, Oklahoma

HELP WANTED

OIL JOB DIRECTORY, foreign and domestic, showing where to apply for jobs. Nationwide, $5.00 cash OIML Co., Box 2603, Tulsa, Oklahoma.

PETROLEUM REFINERY PROCESS ENGINEER

B.S. or M.S. Chemical Engineer with three to five years experience in General Refinery Process Design, preferably with emphasis on TCC or HCC catalytic cracking, sulfuric acid alkylation, catalytic reforming, vapor recovery systems.

If interested, airmail your resume and salary requirements to:

M. D. Daeschner
Assistant Refinery Manager
COMMONWEALTH
OIL REFINING CO., INC.
P. O. Box 1406
Ponce, Puerto Rico

TECHNICAL SALES REPRESENTATIVE

Our company is expanding rapidly and we need help. We are presently located in Tyler, Texas, and expect to relocate in the Chicago area within a year and a half.

We are interested in you if you:

—Have 2 to 8 years experience in petroleum refining and a B.S. in Chemical Engineering

—Are aggressive, like sales work, and prefer to work with minimum supervision

—Want a job where you are badly needed and your efforts will be properly rewarded

—Don't mind traveling

Send resume and photograph to:

R. J. Phillips, President, HOWE-BAKER ENGINEERS, INC.
P. O. Box 956 Tyler, Texas Phone LYric 3-6411

Manager—
MACHINERY ENGINEERING

Responsible for supervising group of engineers performing analysis, specification, application, and testing of compressors, pumps, expanders and other related machinery for low-temperature chemical process plants and systems. Some developmental programs on pumps and expanders also involved. Requires engineer having familiarity with products of major machinery manufacturers plus 10 years' related experience.

Our company is the world's leader in the design, development, manufacture, construction and operation of low-temperature chemical process systems and plants. Broad market diversification and continued expansion makes this key position available for a qualified engineer with ability and energy to assume increased responsibility on advanced technical systems.

Submit resume in confidence, including salary requirements to

J. J. Rostosky, Manager of Recruiting, Dept. 3822.

Air Products
...INCORPORATED
ALLENTOWN, PA.

HELP WANTED

TRANSLATORS—ENGINEERS WANTED. Proven ability to translate technical material into fluent English essential. Attractive full time or free-lance arrangement. All languages of interest, particularly Russian. Send resume to: A•T•S, Inc., Drawer 271, East Orange, N. J.

MANAGER, DESIGN ENGINEERING

Large midwestern natural gas company will employ a graduate, professional engineer for this position. He must have at least 10-15 years' experience in compressor, process and pipeline design. 3-5 years' fully responsible supervision of such work is required.

This is an excellent opportunity for rewarding work and personal development. Stock purchase, pension and other employee benefit plans are excellent. Age limit 45. Send your complete, detailed resume, including salary requirements.

Box M-166
The Oil and Gas Journal
Tulsa, Oklahoma

MECHANICAL ENGINEER

Graduate Mechanical Engineer with minimum of four years experience in petroleum refinery or related engineering. Will be responsible for mechanical design and cost estimate of refinery processing equipment.

Duties will be closely integrated with operation of a modern, independent refinery which includes crude distillation, catalytic cracking, polymerization, coking, hydrosulfurization, catalytic reforming, alkylation, and utilities.

Send complete resume of education and experience, including salary requirements. All replies confidential.

GREAT NORTHERN
OIL COMPANY
P. O. Box 3596
St. Paul 1, Minnesota
ATTN: C. L. Dretzke

International Consultant

I.E. PETROLEUM

Leading international management consultant firm seeks industrial engineers for expanding operations. Initial assignment Middle East.

Requirements:

- 5-10 years' experience, at least partly in petroleum industry.
- Development of job descriptions, training programs, methods and procedures, quality control, non-operating facilities layout, etc.
- An ability to deal effectively with foreign nationals.

Please forward resume, giving complete details on education, experience, and salary requirements.

Box 1182, 1501 Broadway, New York 36

SITUATIONS WANTED

REFINING, SUPERVISORY or operating position. Desires, foreign and short term assignments considered, by experienced chemical engineer: Box M-161, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 10 years exploration South Louisiana, Texas Gulf Coast. Aggressive; excellent record; best references. Executive experience, age 37, married. Box M-182, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPERVISOR, five years production supervisor off-shore operations in Venezuela. Seven years field foreman with major in New Mexico. Two years tool pusher and production foreman with independent in Texas. Wide experience in well completions, drilling and producing operations. Will relocate. Tom Holden, 1734 Briarwood, Abilene, Texas.

GEOLOGICAL-GEOPHYSICAL Engineer, M.S. from the world's foremost school of mineral engineering; Ten years with Major Oil Co.; Three years electronic computors; Wish to locate in Tulsa or Denver; Age 36. Will consider research but prefer staff or administrative work. Box M-176, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 32, M.S., 7 years stratigraphic, structural, subsurface, wellsite, and surface experience. Rocky Mountains and South Louisiana. Full resume on request, personal interview welcomed. Box M-172, The Oil and Gas Journal, Tulsa, Oklahoma.

SAFETY ENGINEER and Metal Inspector. 13 years experience. Presently handling three refineries. Age 36. Box M-169, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM engineer, 40, 15 years diversified experience with major on Gulf Coast. Desire change to aggressive independent. Will relocate. Box M-175, The Oil and Gas Journal, Tulsa, Okla.

SALES REPRESENTATIVE: age 32, 8 years experience in geophysical industry, last 3 years contacting for major geophysical contractor. Interested in sales representative job either domestic or foreign. Full resume on request. Box M-187, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGICAL IMAGINEER—nine years petroleum geology experience, 5½ years exploration and exploitation in South Louisiana—the best domestic oil province. For resume and interview, write or call Tom Eby, JAckson 4-7074, 1144 N. W. 39th Street, Oklahoma City, Oklahoma.

CAN YOU USE 24 years geophysical experience? South America, domestic any capacity up to and including executive levels, employee or consultant. Box M-188, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT, 10 years experience production accounting, drilling cost analysis, purchasing and materials. 7 years South Louisiana. Consider sales. Box M-190, The Oil and Gas Journal, Tulsa, Oklahoma.

MY EXPERIENCE can reduce your drilling costs on the Gulf Coast. Graduate Petroleum Engineer. Box M-191, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

160 ACRE GOLD mining claims, Colorado, Utah. Total cost 25 cents acre, if filed now. Write: Prospector, Box 431, Weleetka, Okla.

BUSINESS OPPORTUNITIES

OIL FIELD Tools and Equipment Sales Representation for American manufacturers, offered for Italy and North Africa especially, by Italian Engineer, retiring from large Company. Highest References Italy and U. S. Address: Box No. M-185, The Oil and Gas Journal, Tulsa, Oklahoma.

I OWN AND am going to sell Geological Library, over 1,300 surface maps covering Oklahoma. Opportunities unlimited as basis for exploration by and development of a new company. Box M-109, The Oil and Gas Journal, Tulsa, Oklahoma.

MOTEL—55 DE LUXE units, and Coffee Shop. Prettiest and best located in East Texas. Not over $60,000 year after expenses and mortgage payments. Requires $150,000 cash down. Sell outright—or I will buy with inactive partner. Have had fourteen years experience in Motels. Harry Elmore, Motel Broker, P. O. Box 8297, Dallas, Texas.

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

LEASE AND DRILLING BLOCKS

WATER FLOOD, 7 stripper wells, next to successful flood Crawford Co., Illinois. 950 feet, 200 acres. Box M-170, The Oil and Gas Journal, Tulsa, Oklahoma.

⅛ WORKING INTEREST in six producing wells, one year old, in Southeast Kansas, in Chautauqua County. Must sell to settle estate. Call TW 2-8736 nights, or write: G. F. Shepherd, 840 Edson Drive, Beaumont, Texas.

FOR SALE OR drilling deal: 30,000 acres of oil and gas leases in Webster and Adams County, Nebraska. Shows of oil have been encountered. Geophysical work, shallow drilling, no pro-ration. A. H. Kottmeyer, Superior, Nebraska.

SOME WORKING interest for quick sale at only $400 per ⅛ interest to drill shallow well soon in proven area. No. 1-A and No. 2-A staked by Geophysical survey on well defined pool with virgin oil. Details, Write: L. Snavely, Geologist, Box 315, Coweta, Oklahoma.

CAPITAL WANTED

CAPITAL NEEDED to drill offset production in Ohio and W. Va. Oil bringing 4.17 per BBL., Gas 25 cents per thousand. David W. Law 716 Union Trust Bldg., Parkersburg, W. Va. Phone HU 5-6446.

NEED FEW more investors, test possible reef, Central Illinois reef belt, send for maps and information. Box M-189, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS SERVICE

DELAWARE CORPORATIONS formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware

CONSULTING SERVICE available in all phases of natural gas compression and treating. Specialized service in natural gasoline plant economics, design and operation. Box M-186, The Oil and Gas Journal, Tulsa, Oklahoma.

Classified Advertising in **OIL AND GAS INTERNATIONAL**

. . . is your most effective way to reach 6,000 important petroleum-industry men in Europe, Africa, and the Middle and Far East every month.

If you sell or want used equipment, are looking for or have a job to offer, have or need investment capital, deal in leases or royalties, or provide a service available in the Eastern Hemisphere, you'll want to use this low-cost method of advertising.

RATES

Display Classified: $13 per column inch. Undisplayed Classified 20 cents per word. 10% discount for running the same copy in three or more consecutive issues.

CLOSING DATE: 15th of month preceding month of publication.

Write: Classified Department, Oil and Gas International, P. O. Box 1260, Tulsa, Oklahoma.

More Discovery Wells

(Continued from page 171)

NEBRASKA

Cheyenne County:

Nebraska Drillers 1 Bergt, C NE SW 17-16n-51w. IPP 148 BOPD, cut 5% bsw. "J" sand 5,173-79 ft. TD 5,256 ft. "J" sand discovery, new Denver basin field.

NEW MEXICO

Eddy County.

Superior Oil Co. 1-134 Government-Federal, 25 miles southwest of Malaga in 12-26s-24e. IPCAOF 347 M.c.f.d., Atoka Penn 7,452-78 ft. TD 10,237 ft. PBTD 7,528 ft. New gas discovery.

Lea County:

Texaco Inc. 1 R. J. Byers, 5 miles northeast of Knowles in 29-16s-39e. IPP 44 BO and 66 BSW 24 hours, 25.6°, Glorieta 6,416-30 ft. TD 8,382 ft. PBTD 6,445 ft. New oil discovery.

Rio Arriba County:

Kay Kimbell 1 Liberman, SE SE 5-25n-7w. IPF 1,780 M.c.f.d., ¾-in. choke, TP 465 psi., CP 592 psi., SITP 2,160 psi., SICP 2,163 psi. Dakota 6,584-6,696 ft. TD 6,887 ft. Dakota discovery, new pool, PBTD 6,885 ft.

OHIO

Fairfield County:

Russell Graber 1 Ben Fisher, Sec. 8, Violet Twp. IP 5 BOPD, Cambro-Ordovician 3,226-3,328 ft. TD 3,328 ft. Oil discovery. Black River 2,568-3,167 ft., Glenwood 3,167-3,226 ft.

SOUTHWEST TEXAS

Starr County:

Texkan Oil Co. 2 La Brisca Land & Cattle Co., Lot 43, Share 215, Porcion 90, A-178, 8 miles northeast of Rio Grande City. IP 83 BOPD, 18/64-in., 44°, GOR 400 cu. ft. per bbl., perf. 3,484-88 ft., Frio. TD 4,350 ft. New pay in West Boyle field.

WEST CENTRAL TEXAS

Brown County:

Great Expectations Oil Corp. 1 J. E. Burkett, 3½ miles northwest of Grosvenor in Sec. 30, HT&BRR Sur. IPP 8 BOPD, plus 93% water, 41.4°, Caddo 2,263-78 ft. TD 2,940 ft. PBTD 2,350 ft. New oil discovery.

Haskell County:

Edward C. Lawson 1 Hendrick Est., 15 miles southeast of Haskell in Sec. 3, ETRR Sur. IPP 23 BOPD, plus 15% water, 36.5°, 1,696-1,702 ft. TD 1,760 ft. New oil discovery.

Jones County:

Robert A. Gordon 1 Gates, 2½ miles northwest of Hawley in Sec. 22, Blk. 15, T&P Sur. IPP 96 BOPD, 37°, GOR 350:1. Tannehill sand 2,034-40 ft. TD 2,452 ft. New oil discovery. Prorated in regular field. S&H Production Co. 1 Louis Nowlin, 5 miles east of Hawley in Samuel Andres Sur. 191. IPF 22 BOPD, 36/64-in. choke, open hole, 39° GOR 250:1. CP 80 psi., TP 0 psi. top of pay 1,884 ft. TD 1,887 ft. New oil discovery.

Stephens County:

Eldorado Oil & Gas Inc. 2 Walker-Buckler, OWPB, 7 miles south of Woodson in Nancy Williams Sur. A-920. IPF 91 BOPD, 24/64-in. choke, 43°, GOR 1,875:1, packer, TP 625 psi. Caddo lime 3,676-88 ft. TD 4,492 ft. PBTD 4,090 ft. New oil discovery.

W. J. Rhodes 2 Black Bros., 10 miles north of Breckenridge in Sec. 1135, TE&L Sur. IPF 205 BOPD, 10/64-in.

choke, 41°, GOR 434:1, packer, TP 775 psi., open hole Miss. lime at 4,377 ft.; IPF 203 BOPD, 10/64-in. choke, 42°, GOR 1,400:1, CP 100 psi., TP 550 psi., Marble Falls congl. 4,008-16 ft. TD 4,385 ft. Dual zone oil discovery.

Taylor County:

Prorated in regular field. Dixon Drilling Co. 1 Grover Nelson, 3 miles northwest of Buffalo Gap in Sec. 10, Blk. 2, SPRR Sur. IPP 30 BOPD, 38.9°, GOR 500:1, Flippen sand open hole 2,514 ft. TD 2,519 ft New oil discovery.

Prorated in regular field. Fletcher Oil & Gas Drilling Corp. 1 V. Graham, 3 miles north of Bradshaw in Subd. 3, H. Corzine Sur. 508. IPF 60 BOPD, 18/64-in. choke, 38°, GOR 475:1, packer , TP 220 psi. Dog Bend sand 4,054-58 ft. TD 4,710 ft. New oil discovery.

Prorated in regular field. J. W. King Co. 1 Fred Guitar, OWWO, 2 miles northwest of Merkel in Sec. 19, Blk. 18, T&P Sur. IPP 61 BOPD, plus 33% water, 40°, GOR 200:1. Flippen lime 2,750-56 ft. TD 4,210 ft. New oil discovery.

Throckmorton County:

Prorated in regular field. H. R. Britton 1-B Joe B. Matthews, 14 miles southwest of Throckmorton in Subd. 46, Comanche Indian Reservation, Sur. A-1341. IPF 30 BOPD, 12/64-in. choke, 40.2°, GOR 300:1 CP 320 psi. TP 60 psi. 3,445-53 ft. TD 3,884 ft. New oil discovery.

UTAH

Uintah County, Rock House unit:

Shamrock Oil & Gas Corp. 1 Unit, SE SE 10-11s-23e. IPF 12,500 M.c.f.d., Wasatch, open flow; IPF Mesaverde 900 M.c.f.d., open flow. Wasatch-Mesaverde discovery, new field. TD 7,384 ft.

WYOMING

Campbell County:

Pan American Petroleum Corp. 1-Hembdt-Federal, SE NE 13-53n-70w. IPP 90 BOPD, cut 25% water. Minnelusa 7,483-7,502 ft. TD 7,666 ft. PBTD 7,600 ft. Minnelusa discovery, new field.

Niobrara County:

Union Oil Co. 1 Government, C SW SE 29-37n-64w. IPF 93½ BOPD, 25/64-in. choke, 37.5°, CP 500 psi. Mowry 7,426 and 7,428 ft. TD 7,970 ft. Mowry discovery, new field.

Sweetwater County:

Jackknife Spring unit. Mountain Fuel Supply Co. 1 Unit, SW NW 11-16n-101w. IPF 7,220 M.c.f.d., TP 1,460 psi., CP 1,675 ft. Mesaverde 5,335-6,336 ft. TD 6,680 ft. PBTD 6,436 ft. Mesaverde discovery, new field.

Gulf Oil Corp. 1 Leon, C NE SE 18-19n-99w. IPF 65 M.c.f.d., 4 BFPD, 75% load oil, 12/64-in. choke, TP 110 psi., CP 360 psi. Almond discovery, new field. TD 3,730 ft. PBTD 3,476 ft.

LEGAL

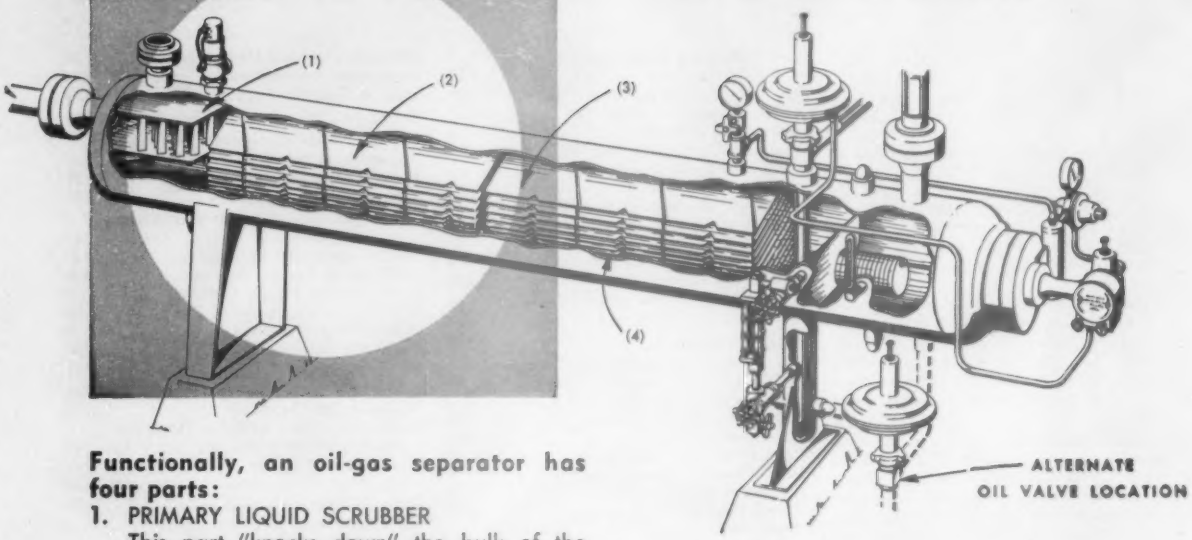
U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that one parcel of land totaling 200 acres, within the known geologic structure of the Clareton field, Weston County, Wyoming, is offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, January 18, 1961, when bids will be opened. Full details of the offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Arvin H. Olswold, Chief, Minerals Section.

ADVERTISERS

. . . in this issue

ACF Industries, Incorporated, W-K-M Division 51
Air Preheater Corporation, The 36
Aldrich Pump Company, The 37
Amercoat Corporation 62
American Iron & Machine Works Company Subsidiary, American Machine & Foundry Company ..... Back Cover
American Machine & Foundry Company—American Iron & Machine Works Co. ..... Back Cover
American Meter Company 26
Anderson Company, The V. D. 146
Associated Electrical Industries Export Ltd. 45
Baker Oil Tools, Inc. 68
Ball Brothers Research Corp. 133
Baroid Division, National Lead Co. 13
Bendix Corporation, The—
Bendix Computer Division 144
Scintilla Division 12
Bethlehem Steel Company 28, 29
Black, Sivalls & Bryson, Inc. 8
Bovaird Supply Co., The 1
Brown Fintube Company 87
Byron Jackson Tools, Inc., A Subsidiary of Borg-Warner Corporation 115
Cabot Corporation, Machinery Division ..... Inside Back Cover
Central Scientific Co. 140, 141
Chicago Bridge & Iron Company 54
Classified Advertising 182, 183, 184
Computers, Incorporated 140
Darling Valve and Mfg. Co. 65
Davison Chemical Company Division of W. R. Grace & Co. 58
Dover Corporation—
The W. C. Norris Manufacturer Division 141, 168
Dow Corning Corporation 66
Dowell 138, 139, 152
du Pont 9
Eaton Manufacturing Company, Axle Division 7
Edward Valves, Inc. 153
Electric Machinery Mfg. Company 22
First City National Bank of Houston 172
First National Bank in Dallas 154
First National Bank & Trust Co. of Tulsa 6
Flight Refueling, Inc. 57
Flint Steel Corporation 143
Fluid Packed Pump Co., Division of The National Supply Company 17, 18
Ford Motor Company 60, 61
Foster Wheeler 46, 47
Frick Company 124
Gates Rubber Co., The 2
Goodrich Chemical Company, B. F. (Geon) 5
Gould Pumps, Inc. 49
Grace & Co., W. R.—
Davison Chemical Division 58
Gray Tool Company 166
Griscom-Russell Co., The 20
Guiberson Corporation 162
Halliburton Company 10, 11, 93
Hamilton-Thomas Corporation 20
Harrisburg Steel Co. 145
Hudson Engineering Corporation 135
Huey & Co., S. E. 148
Hycalog, Inc. 164
Ideco, one of the Dresser Industries, Inc. 129
International Harvester Co. ..... Inside Front Cover, 30, 31
International Nickel Company, Inc., The 70
Jefferson Chemical Company, Inc. 33
Johns-Manville Corporation 32
Jones & Laughlin Supply Division 38, 39
Kelley Co., Inc., Ben F. 141
Larkin Packer Company, Division of Koehring Company 159
Lincoln Electric Company, The 14, 15
Lone Star Steel Company 122, 123
Maloney-Crawford Tank and Manufacturing Company, Inc. 165
Martin Manufacturer, John N. 147
McDonough Marine Service 148
Mid-Continent Supply Company 27
Midwest Piping Company, Inc. 23
Mission Mfg. Company 4
Mobil Oil Company 151
Nalco Chemical Company 19
National Tank Company 186
National Tube Division 52, 53
Nordstrom Valve Division, Rockwell Manufacturing Company 116, 117
Norris Manufacturer, W. C., Division of Dover Corporation 141, 168
Oil States Rubber Company 150
Oil Well Supply Division 3
Olin Mathieson Chemical Corporation, Chemicals Division 88
Otis Engineering Corporation 59
Petreco A Division of Petrolite Corporation 56
Reda Pump Company 146
Refinery Supply Co., The 140, 141
Republic Rubber Division of Lee Rubber & Tire Corp. 143
Roebling's Sons, John A.—Division of The Colorado Fuel and Iron Corporation 21
Roper Hydraulics, Inc. 134
Ross-Martin Company 147
Salt Water Control, Inc. 40
Schlumberger Well Surveying Corp. 169
Stephens Engineering 148
Strahman Valves, Inc. 57
Teletype Corporation Subsidiary of Western Electric Company, Inc. 24, 25
Texaco Inc. 41
Texas Employers Insurance Association 118
Thornhill-Craver Co. 85
Twin Disc Clutch Company 44
UGC Instruments A Division of United Gas Corp. 64
Union Carbide Chemicals Company, Division of Union Carbide Corporation 16
United States Steel Corporation—
National Tube Division 52, 53
Oil Well Supply Division 3
Universal Atlas Cement Division 136
Viking Pump Company 148
Visco Products Co., Inc. 43
Vogt Machine Co., Henry 50
Wall Colmonoy Corporation 146
Wedgeping Valve Company Division of Stockham Valves and Fittings 63
Well Equipment Mfg. Corp. 167
Western Plastics Corporation 170
Western Supply Company 126
Westinghouse Electric Corporation 130, 131
Wheeler Mfg. Co., C. H. 20
White Diesel Engine Division, The White Motor Company 34, 35
W-K-M Division of ACF Industries Incorporated 51
Worthington Corporation 42
Wyandotte Chemicals—Michigan Alkali Division 48
Zink Company, John 142

NATIONAL® MONOTUBE® SEPARATORS



Functionally, an oil-gas separator has four parts:

1. PRIMARY LIQUID SCRUBBER
   This part "knocks down" the bulk of the liquid and removes it from the flowing gas stream immediately.
   National's present design is the result of field tests using full scale operational models which utilized numerous scrubbing elements. From these tests National's present design was found. Today, when you buy a National MONOTUBE Separator, you buy experience, not experimentation.
2. MAIN GAS SCRUBBER
   Also as a result of these tests, proper spacing and length of Main Gas Scrubber plates was discovered, so as to effect the greatest liquid removal from the gas stream.
3. FINAL GAS SCRUBBING
   The multiple field tests with flanged components dictated our design. National's "straight-vane" design accomplishes final liquid removal without the use of "excelsior-like" elements which are prone to be plugged with waxes, sands and other extraneous materials, including hydrates inherent in the normal oil-gas and distillate production operations.
4. OIL DE-GASSING COMPARTMENT
   What effects oil de-gassing? (a) Length of time in compartment. (b) Surface area of oil body. (c) Scrubbing surfaces to remove entrained gases. When (a), (b) and (c) are at a maximum, oil de-gassing is best. National's full-scale field testing found the proper ratios.

NON-FREEZE VALVE

A field-proven, non-freeze liquid valve, particularly useful on high gas-oil ratio wells where entrance temperatures are near hydrate point. Ask your National man about this exclusive feature.

It's a National®

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

SERVICE

'ROUND-THE-CLOCK

Pumping unit value is only as good as the service that stands behind it. This is why Cabot maintains convenient 'Round the Clock service centers throughout the oil industry . . . service centers with complete stocks of Cabot parts and manned by factory trained personnel. This is your 24-hour-a-day guarantee that Cabot will deliver dependable pumping. CALL YOUR J&L MAN...

OIL FIELD PUMPING EQUIPMENT
CABOT
PAMPA, TEXAS
FRANKS

CABOT CORPORATION
MACHINERY DIVISION

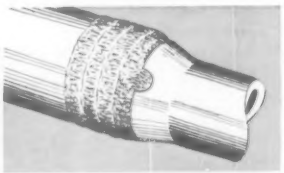
Why you should specify

AMERICAN IRON

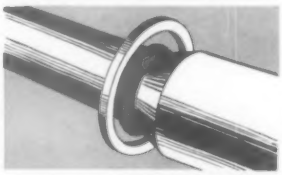
Flash Welded TOOL JOINTS

on your next string of drill pipe!

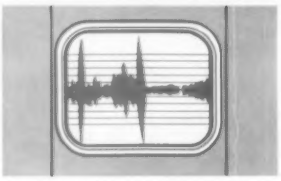
Here are three of the many reasons why you buy QUALITY when you specify AMERICAN IRON.



1. TUNGSTEN CARBIDE Hard Metal Bands are available on all American Iron Tool Joints. They are applied PRIOR to heat treatment which eliminates chipping, rapid wear and does not affect the physical metallurgy of the tool joint.



2. The "WEDDING BAND": a heat treating process used by AMERICAN IRON, which more than *doubles* the tensile-impact strength of the Flash Welded connection.



3. The REFLECTOSCOPE is a new electronic testing apparatus used by AMERICAN IRON for inspecting the weld zone for inclusions and defects. This assures you of *maximum performance* from your string of Flash Welded Tool Joints.

Specify Flash Welded OPEN-HOLE Tool Joints for your Lightweight Drill Pipe.

AMERICAN IRON

Another AMF Product
PETROLEUM EQUIPMENT

AMERICAN IRON & MACHINE WORKS COMPANY, INC.
518 North Indiana Avenue • Oklahoma City, Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

AMERICAN IRON & MACHINE WORKS CO. INC. — MANUFACTURERS OF OILFIELD EQUIPMENT — A — OKLAHOMA CITY